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Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

No. 64

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STUDY ASSESSES ARAB NUCLEAR CAPABILITIES

Beirut AL-ANWAR in Arabic 27 Jul 80 p 11

[Article: "Study of 'Reports and Backgrounds' on Europe's Role in World-wide Nuclear Strategy; Arab Capabilities Compared With Soviet Nuclear Armaments"]

[Text] The possibility that Iraq may join the nuclear club has recently aroused considerable clamor in international and regional gatherings. Local or worldwide coverage of that matter, however, was generally confined to an extremely narrow point of view. This coverage ignored numerous complex and interconnected factors without which the nuclear problem in general and the current nuclear crisis in particular cannot be understood. Before this question was recently taken up by the media, a publication entitled, "Reports and Backgrounds" was published by the Center for Research and Studies of DAR AL-SAYYAD [Lebanese magazine publisher]. It was distributed to subscribers only. This publication had raised all the anticipated dimensions and complications of the question in the issue that came out last 10 May. It was a lengthy, scientific study. AL-ANWAR reprints here the most noteworthy matters that were mentioned in the aforementioned study.

The publication deals first with the role of European countries in worldwide nuclear strategy. This sheds some light on the current French role. Then the study moves to the problem of nuclear armaments in Third World countries. [The following] is among what it says in this regard:

"The question of the entry of the Third World into the field of nuclear technology is an extremely delicate subject. The Third World is marked most by its poverty and by its ignorance. Can it in this condition enter into the world of nuclear armaments with its rockets, its satellites and its space ships?

"This self-evident question does in fact go beyond another question: Can the Third World in return absolutely refuse to enter the world of nuclear armaments, especially since nuclear arms guarantee the state the protection that may not be absolutely guaranteed by all kinds of regular arms regardless of their magnitude and their kind?

"The fact that India, as backward as it is on all levels, has entered the world of nuclear weapons did reopen the discussion on this question, especially since the question of nuclear arms for Third World countries is different from that of other countries.

"The fact is that opinions on this subject differ. One group believes that countries of the Third World have to crystallize their nuclear weapons, but another group thinks that such action would be worthless and futile."

Arab Nuclear Capabilities

The study devotes a special chapter to Arab nuclear capabilities, and it focuses especially on the Iraqi reactor and the nuclear bomb project between Pakistan and Libya. In this regard the study says [the following]:

"Activities in the Arab countries with regard to the utilization of nuclear power have been slow throughout the period that began with the emergence of nuclear power until the early seventies. We note that these countries began giving greater attention to nuclear power, especially since the principal [source of] energy upon which the economy of most of the Arab countries depends is threatened with depletion. We notice in this regard that interest is focused on three principal essential matters.

1. The first essential matter is based on finding an alternative for oil. These alternatives propose nuclear energy as a possible substitute for the depletable energy.

2. The second essential matter pertains to stimulating national interest in nuclear energy. This stimulation does not take place at random but rather within certain departments that assume the responsibility of doing what is necessary to implement the aforementioned policy. The successful implementation of these two items did in fact lead to a collective Arab enthusiasm about the problem of nuclear power. This enthusiasm became evident in the most notable demonstration that took place during the Third Arab Conference that was held in Rabat in 1977. The fact that some Arab countries were leaning toward strengthening their nuclear technology reflected these countries' real desire to establish a nuclear power that would also have some influence on the military scene. By making a simple deduction from all the facts that we mentioned we can say that uranium exploration and investment operations have undergone considerable progress in some Arab countries, especially in Iraq, Somalia, Sudan, Morocco, Jordan and Algeria.

We notice in this regard that what these countries in particular have provides them with the technology that is necessary to manufacture uranium. We also notice, on the other hand, that some progress pertaining to a nuclear fuel course of instruction has been achieved. But none of the elements of this course has been completed, and the Arab countries still have much to do to achieve progress in this area. What attracts one's attention in the field of nuclear Arab technology is the fact that the Arabs did not combine their financial and technological efforts under one administrative agency that would contribute effectively to the establishment of an independent Arab nuclear fuel course of instruction. In order to realize the results they are hoping for, the Arabs have to focus their best interests on this subject in particular so they can combine all their professionals in one organization, especially since those professionals are not all that numerous.

This is on the one hand. On the other hand, we notice that to improve the nuclear technology it has, the Arab world depends on two kinds of initiatives:

1. The first initiative may be summarized in imports. Several countries have resorted to this matter, like Algeria, for example. During the days of former President Boumedienne, Algeria did not hesitate to realize this matter.

2. The second initiative may be summarized in [an effort] to undertake the establishment of research institutes that would earmark their budgets and confine their efforts to studying this technology--the technology of the nuclear reactor.

We note in this regard that the countries which did adopt these two methods did overcome many difficulties and make considerable progress in the process of acquiring a command of the nuclear technologies. Among the Arab countries that adopted this method we mention Algeria. We have already noted that Algeria did establish a center for the technological and nuclear sciences and that it did become qualified to manage its reactors. These reactors, in turn, are being intensely studied so that they may be manufactured in Algeria in the near future. This, however, does not mean that the countries which followed in Algeria's footsteps constitute an overwhelming majority. On the contrary, we only find Egypt and Iraq trying to catch up with the Algerian procession so as to establish a national technology whose basic function would be to acquire a command of heavy nuclear technology.

Let us now shift to the question of the human capabilities that are available in the Arab countries. What do we observe in this regard?

We observe at the outset that the Arabs had not kept up with the development of nuclear technology in the world. They satisfied themselves with observing the matter from a distance as though it did not concern them. They did not, for example, take steps to qualify themselves in the near future at least so as to have their own scientists in this branch of science. Proceeding from such a posture we saw how very slow the Arab countries have been in developing their human and technological capabilities. This led to the placement of many obstacles that pertain to the course of nuclear science and technology in the Arab homeland. But this does not mean that the delay led the Arabs to leave the subject of nuclear science and technology alone. On the contrary we see them recently rushing enthusiastically to acquire a nuclear weapon. We saw that Morocco was able to obtain huge uranium reserves and that Algeria acquired that large center which specializes in the nuclear sciences and technologies. We saw that Egypt and Iraq have been trying to forge their own path in this area.

We are finally to call attention to the fact that increasing cooperation with all the countries is necessary because the study of nuclear technology must not be carried out in isolation from those results that may have been achieved in other countries. It is certain in this regard that increasing cooperation with a number of countries in this area will help in saving much effort and money. The Arab governments in question have not--at least not yet--taken notice of this matter in the area of developing nuclear technology; or they have not given this matter a sufficient measure of their attention.

After this general review of the future nuclear capability let us shift now and look into two important matters. They are the question of the joint Libyan-Pakistani nuclear bomb and that of blowing up the Iraqi nuclear reactor in the port of Toulon. These two [cases] clearly indicate the desire of the superpowers and of Israel to prevent the Arabs from producing a nuclear bomb. We shall see that Israel and the United States did not hesitate in carrying out suicidal operations or in threatening to resort to this method so as to prevent the Arabs from developing their own nuclear technology.

The Iraqi Reactor

The question of blowing up the equipment of the nuclear reactor that was being prepared for shipment from the port of Toulon in France to Baghdad has raised many questions. The Iraqi Government was to have taken delivery of this equipment between 9 and 16 April of 1979. But on the 6th of April there was an explosion that turned the equipment into rubble, and since rebuilding this equipment requires at least 2 years, this means that completing the construction of the first Iraqi nuclear reactor will be delayed 2 years. But it seems that Iraq is insisting on not waiting, especially since it relies on its private agreement with France to justify not waiting. The French-Iraqi agreement had determined that 2 years would be the maximum period for completing the construction of the reactor, operating it and furnishing it with low enriched uranium. This would make it necessary for France to guarantee a substitute for the destroyed equipment from another French reactor. It seems that private, secret negotiations on the highest level around this subject are underway between Baghdad and Paris.

However, the question that is in fact being raised is this: Who is responsible for the explosion and who had an interest in it?

Israel has the greatest interest in this explosion taking place so as to prevent Iraq from acquiring reactors that would help it in the future develop its nuclear technology. Among the contradictions in this matter is the claim by one of the Israeli newspapers that it was a Palestinian group that had carried out the operation. The Israeli newspaper did not stop with this measure of confusion. It added that the aforementioned Palestinian group was working for one of the Arab countries. Israel's objective in making this accusation is perfectly clear: it wanted to drive a wedge in the bilateral relations between the two countries which were then working together toward unity. To carry the Israeli distortion campaign further several organizations deliberately claimed responsibility for the incident. Among these organizations we mention [the following]: an extremist leftist organization, a West German terrorist organization and, last but not least, a French organization that claims to be [interested in] protecting the environment. But none of these campaigns deceived French investigators who are affiliated with the counterespionage French administration which is known as D.S.T. The investigators realized significant results, the most notable of which was [the discovery] that the agents who had carried out this operation were real professionals. This was indicated by the advanced technology that was used in the explosion.

French investigations went even further than that when the counterespionage administration pointed an accusing finger at Israeli commandos and accused them of destroying the nuclear equipment. It is known that Israel had repeatedly expressed its extreme anxiety because of the fact that a nuclear experimental unit had been sold to Iraq. Israel had warned the French Government that Iraq may use this nuclear unit in the future to produce an atomic bomb. We are thus assured that Israel would not hesitate to carry out sabotage operations for the purpose of preventing the arrival of the nuclear equipment in the Arab countries out of fear that these countries may use them for their own non-peaceful purposes.

Ultimately, what is left is to call attention to the fact that blowing up this reactor does not mean that Iraq does not have such reactors. The Soviet Union did sell Iraq a nuclear reactor more than 10 years ago, and there is a French-Iraqi nuclear agreement that requires France to sell Iraq a nuclear reactor that is bigger than the one which was destroyed in Toulon.

The Atomic Bomb Project Between Pakistan and Libya

The uproar that the United States created against the attempt made by Pakistan and Libya to produce a joint atomic bomb has subsided now, but the Western anxiety over this question which is disturbing the sleep of people in the West has not.

The fact is that the United States of America was hard pressed when it decided to undertake this campaign especially since these days in particular Pakistan is a very significant point in U.S. strategy. No sooner does one glance at a map than it becomes evident that the United States has no access to Afghanistan except through Pakistan. U.S. aid to the Afghan rebels is collected in the Pakistani city of Peshawar, and it is transported from there by beasts of burden, across the Khyber Pass to the heart of Afghanistan where the terrain of revolutionary rebellion against the regime that is loyal to the Soviet Union is expanding. Pakistan then is the only window from which the United States of America can look at Afghanistan, especially after Iran got out of the U.S. sphere of influence and entered into a direct struggle against the government of the United States.

Based on this matter in particular we have seen that the United States was not able to exaggerate much in its campaign against Pakistan. It also made no direct or remote reference to Libya whose close complicity in the matter has been confirmed by different reports. These reports even go so far as to affirm that Libya is a full partner in the project. In addition to this self-evident fact there are various secondary facts, and understanding them may be beneficial. Among them is the fact that Libya is not the only Arab country that is involved in this project; numerous Arab countries are in fact contributing to it. Their contribution is not like Libya's: it is rather [confined to] financial support only. Among those facts also is the fact that most of the Arab countries support Pakistan and Libya in their project even though doubts are aroused here and there about Colonel al-Qadhdhafi's objectives in acquiring such a bomb. Regarding the reason why the Arabs support the production of this bomb by Libya and Pakistan, they do so because they strongly believe that in case the bomb is built, their cause will be served, especially since events affirm that numerous foreign agencies are trying to prevent them from producing an atomic bomb. Furthermore, these foreign agencies are even preventing them from acquiring nuclear reactors that may give them the capability of acquiring such a bomb in the future. This matter has led to the occurrence of terrorist operations in various areas of the world. Perhaps the most notable of these operations was that of blowing up the nuclear installations which Iraq had purchased from the French Government. We will come back to that matter in a subsequent section, but the question that is being raised now in international circles is as follows: Can Pakistan and Libya produce an atomic bomb?

The International Inspection Authority, which has its main offices in Geneva, has proof that Pakistan and Libya can produce an atomic bomb in a period of time that may vary from 6 months to 2 years. If we were to go back to the technology that is in use in both Libya and Pakistan, it would become evident that the nuclear program in Libya and Pakistan depends on converting uranium wastes that are emitted by the nuclear reactor to plutonium 239, which is necessary for manufacturing a nuclear bomb. The Pakistani program is overseen by Dr 'Abd-al-Qadir Khan who tried to purchase from the Netherlands and then from West Germany a small reactor to convert uranium to plutonium, but he failed in his attempts. The Libyan nuclear program is overseen by the Atomic Research Center which was specifically established to further investigations into Arab nuclear research.

In going back to the Pakistani nuclear program it becomes evident that Pakistan's failure to purchase a nuclear reactor is due to numerous factors. Perhaps the most important of these was the pressure exerted by the United States to prevent the sale of such a reactor to Pakistan. U.S. pressure even reached the point of threatening military intervention. Reliable sources that are close to the U.S. Pentagon did reveal that the U.S. Government had threatened to send a U.S. commando unit to destroy the reactor if Pakistan did not own. Based on this matter in particular, Pakistani President Zia-ul-Haq tried to assure the governments of the world that his intentions were good. After participating in the Summit Conference for Nonalined Nations in Germany he announced that Pakistan was not in the process of manufacturing a nuclear bomb.

It seems that this announcement led to the softening of the United States' intransigence, and a nuclear reactor was shipped to Karachi. Pakistan can thus manufacture one atomic bomb from only 5 kilograms of plutonium 239, whereas previously it would have needed 21 kilograms of 80 percent high enriched uranium 235 to make a bomb similar to the previous one.

Does this mean that success has become the lot of Pakistan and Libya, especially since Libya has not yet succeeded in purchasing a reactor that would assure it of producing an atomic bomb? It may be premature to predict results, but it seems that by cooperating with Pakistan, Libya has achieved considerable progress after its past individual isolated attempts had failed. All of us still remember that Libya tried to negotiate this matter with China in 1970 when Maj 'Abd-al-Salam Jalud went to Beijing for this reason. China, at that time, rejected that proposal.

The question that is being raised now in the midst of these attempts is this: Can Libya and Pakistan produce an Arab-Islamic nuclear bomb that would be tantamount to a response to the Israeli challenge which manifests itself in the production of this kind of bombs?

Israeli Nuclear Armaments

The study makes a comparison with Israeli nuclear armaments and says:

"Israeli nuclear armaments are still arousing many fears in the world. It is natural that the United Nations be most concerned about this subject, especially since Israel is a confrontation country. This means that Israel may one day be forced to use this weapon if its national security were exposed to danger. Based on its concern with this matter the UN Committee on Disarmament asked the Arab countries to prepare a report about Israeli armaments in general and nuclear armaments in particular. What then was the conclusion of the Arab report that was submitted to the UN Committee on Disarmament?"

The report revealed significant facts, among which is the fact that the Israeli military budget was considered one of the largest budgets in the world and that Israel was in first place in military spending relative to its general national income. In 1966 these expenditures were 10 percent of the total general national income, that is, about 25 percent of the total general budget; military spending in France, Britain, Italy and West Germany, however, was 3 to 4 percent of the general national income during that period. The report noted, on the other hand, that after the end of the October 1973 war the Israelis had increased the military budget by 1,250 million Israeli pounds, making [the total] of that budget 7.6 billion pounds. Benhas Sapir, who was Israel's minister of finance at that time, also stated that the 1973 war had cost the Israeli economy 4 billion pounds during its first 4 days; that is one-fifth of Israel's budget for fiscal year 1972-1973. Sapir said that the costs of the October War were estimated at about 8 billion dollars. Officials in the Israeli Ministry of Defense estimated the value of what Israel needed to make up for the materiel and weapons it lost during the war to be 22 billion [dollars].

Israel solved the problem of obtaining natural uranium from several sources without supervision [as follows]:

1. Israel has its own sources. It has a plan to increase uranium production fivefold, that is, from 10 to 50 tons. By achieving self-sufficiency [in uranium production] the permanence of work without restrictions becomes possible, and expansion in the production of phosphates would follow.

2. Israel obtains uranium from abroad--from South Africa, France and from some African countries.

3. Israel obtains uranium illegally. Many Western and Israeli sources revealed details of thefts and of the secret transportation of quantities of natural uranium from the United States and Europe in 1966, 1968 and 1969. Israel paid about 3.7 million dollars in scientific aid to West Germany in return for 200 tons of uranium that were transported secretly after an agreement with the ship Cherbourg had been made in November 1968. The uranium was to have been transported from Germany to Italy but the ship's cargo was moved at sea to an Israeli vessel. The case is the same with regard to the theft of uranium from the United States of America. Uranium was stolen from the Apollo laboratory in a plant in Pennsylvania. The CIA revealed the details of this theft

which was carried out over a period of years. This disclosure was made in the CIA's memoranda on Israeli nuclear armaments in two appendices to the first report that was published in September 1974. The two appendices were published in November 1974.

In 1974, 48 countries voted again on the Nuclear Nonproliferation Treaty, and 27 new countries added their names to the list of signatories. However, Israel was one of seven countries that openly preferred to abstain from signing the treaty. Egypt made the Egyptian signature contingent upon Israel's. There is a steady relationship between the availability of traditional weapons that are specially prepared to convey and to carry the nuclear weapon to its target. At present the purpose behind obtaining a nuclear weapon determines to a large extent the selection of the special weapon that will direct the nuclear blow. These weapons are considered necessary and complementary to the production of nuclear weapons since without them the bomb cannot be carried to its required target. There are no less than 13 kinds of military airplanes that can carry nuclear weapons. This is in addition to the long-range bombers and the missiles that are launched from sea or land bases. But the latter two are considered to be exorbitant in cost and expenses. They have been currently replaced with the Crusoe missiles which have a lower price tag.

But with regard to Israel the nuclear transport carriers it has are as follows:

A. Military aircraft:

The Mirage-3 [airplane] has a fighting range of 745 [miles] and is exported by France.

The A-4 Sky Hawk airplane has a fighting range of 400 and is exported by the United States of America.

Finally, there is the Phantom F-4 whose fighting range is 750 also; the United States of America exports this kind of aircraft also.

The Nuclear Arms Race

The study ends with an appendix that deals with the most prominent developments that are taking place on the nuclear scene in the Middle East. The study states:

"It seems that 1980 will be the year during which the nuclear arms race in the Middle East will be carried out openly. Although all the countries in the area are proclaiming publicly that they do not intend to produce nuclear weapons, the capability of a number of them to do so is growing quickly. Evidence is growing that some oil producers have begun to appreciate what Iraqi President Saddam Husayn calls 'the strategic price'—that is, transferring Western nuclear know-how in exchange for their basic strategic material which is nearby. In addition, the military government of Pakistan appears to be able in 1 year or 18 months to have the capability to conduct the first experiment in the world to explode the Islamic atomic bomb."

This is an important development for Israel even though intelligence experts believe that Israel's reserve of nuclear weapons is significant. A 1974 analysis by the Central Intelligence Agency had mentioned that the Israelis had developed a nuclear arsenal.

Counter Weapons

Iraq and Libya are among Israel's bitter enemies who are using their oil to develop counter weapons. Iran has two reactors whose construction has presently been frozen, but work can be resumed on them easily. Syria is expected to open bids for planning studies to be carried out for a nuclear program worth 3.6 million dollars to be completed by 1990. Western defense analysts fear that pressures to equalize the nuclear muscles among neighbors may force Egypt, which is currently peaceful, into a nuclear direction before this date.

All the countries of the Middle East surround their plans and capabilities for nuclear development with secrecy, observation and denial. However, there are at present numerous indicators that clearly show that a trend in the area toward competition in nuclear weapons does exist.

Iraq and Italy

In 1978 a group of Italian corporations agreed to sell Iraq four nuclear laboratories. Details about this deal were leaked to the U.S. press in March 1980. They revealed that one of the laboratories was a "Sarah cell" and that there were well-secured nuclear facilities that can be used for work with uranium enriched weapons. The Italians replied to U.S. objections by referring to the fact that Iraq had signed the nuclear nonproliferation treaty, that the United States had been notified of the deal 2 years earlier and that it had approved of it. The deal provides for a basic relationship in any weapons building program. For Italy, Iraq is a basic oil exporting country. It supplies Italy with 20 percent of its imports. The shares of INI, an oil company owned by the Italian Government rose from 350,000 [barrels] per day in 1979 to almost 410,000 barrels per day in 1980.

Iraq and France

In accordance with a nuclear cooperation agreement that was signed in 1975, France will supply Iraq with 12 or 13 kilograms of 93 percent enriched uranium by the end of 1980 or by early 1981. These materials constitute the first shipment of several to operate a 70 MW Osiris reactor which France had sold to Iraq in 1976. In mid-1978 an explosion destroyed the components of a plant that was being shipped from France. It is believed that Moussade, the Israeli counterpart of the Central Intelligence Agency, was responsible for this explosion. Despite this setback the French did rebuild the plant.

France is a principal customer of Iraqi crude. Its share of Iraqi oil rose from 18 percent in 1979 to almost one-fifth of its total imports.

Israel and South Africa

In September 1979 there was a huge explosion on the coast of South Africa. U.S. surveillance satellites recorded the fallout from that explosion. Some intelligence agencies considered this experiment to be a joint South African-Israeli nuclear experiment. [They thought] it was most likely a neutron bomb. Reports about Israeli-South African cooperation, according to which South Africa offers uranium [in return] for Israeli technology, have become common even though both governments deny that such cooperation exists. But military observers in the Arab world give these reports a large measure of credibility.

Israeli officials in return are very worried about the growth of Arab and Islamic nuclear programs. The more immediate danger is Pakistan's acquisition of a nuclear capability. Although Pakistan is not on the scene in the Middle East, it is an Islamic country and a potential exporter of weapons to Israel's enemies.

The Pakistanis pushed their uranium enrichment program to the degree of purity that is required for [the production of] bombs. Some of this enrichment did in fact take place in the hot cell facilities that resemble the laboratory which Italy sold to Iraq. It is believed that Libya financed this project. The principal hindrance to Pakistan's nuclear weapons program appears to stem from the knowledge of India's reaction to the fact that Pakistan was joining the nuclear club. India had conducted its [nuclear] experiment in 1974.

A more direct response may come from Israel. Numerous Israeli defense officials see the possibility of the proliferation of nuclear weapons in the Middle East as the greatest danger that is threatening the existence of Israel. They are making plans so that they would not be standing with hands tied behind their backs when this proliferation does take place. One of the Israeli officials in the nuclear sector said, "Moussade will be very busy in the next few years aborting the nuclear programs in the Arab world."

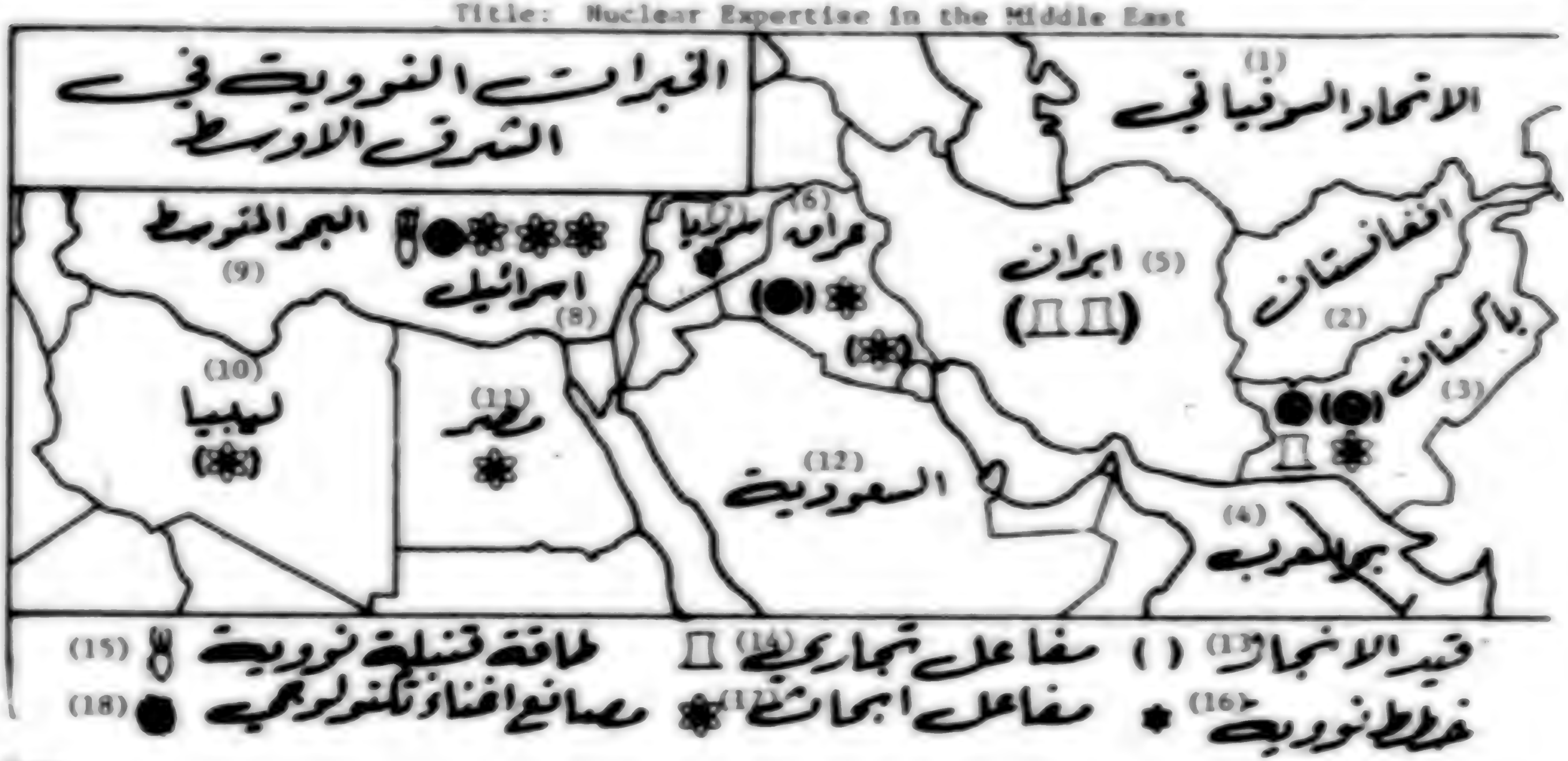
A Table of the Countries That Are About To Become Nuclear Powers

The Country	Raw Material Availability	Reactor Capability till 1980	Uranium Enrichment	Separation Process	Nuclear Weapons Non-Proliferation Treaty Did Not Sign the Treaty 3 Signed First Time Only Endorsed Signing of Treaty	Time Period in Years
Argentina	Yes	1,000	Not available	Yes	No	10
Brazil	Yes	1,500	Not available	No	No	8
Chile	Yes	500	No	Not available	No	16
Egypt	No	600	No	No	Signed	10
India	Yes	3,000	No	Yes	No	—
Indonesia	No	500	No	No	Signed	16
Iran	Yes	2,000	No	Not available	Signed	10
Israel	Yes	600	No	Yes	No	--
Japan	No	5,000	No	Yes	Signed	3
Pakistan	Yes	1,000	No	Not available	No	8
South Africa	Yes	300	Yes	Not available	No	3
South Korea	No	500	No	No	Signed	10
Spain	Yes	5,000	No	No	No	10
Taiwan	No	1,000	No	No	Endorsed	10

Nuclear Power Reactors That Are Operating Publicly, Are on Request, or in Planning Stages in Arab Homeland

The Country	Reactor Mode	Power Megawatt	Condition	Year	Source	Location
Algeria (59)			Intense compliance with reactor technology by means of which Algerian nuclear reactor can be built			
Egypt (60)	For research	2	Operating	1961	Russia	Anshas
	For research	2	Announced	1980	Russia	Anshas
	Light water		Planned	1983	America	Sidi Karir
	Light water	600	Planned	1985		
	Light water	600	Planned	1989		
	Light water	600	Planned	1990		
	Light water	600	Planned	1991		
	Light water	600	Planned	1993		
	W	1,000	Planned	1995		
	Heavy water	1,000	Planned	1997		
		1,000	Planned	1999		
	Total	6,605		2000		
Iraq (61)	For research	Unknown	Operating	1968	Russia	
	Osiris	70	Planned	1980	France	
		600	Agreed to	1975	France	
	Quick generating	Unknown	Agreed to	1975	France	
Kuwait (62)	For research	50	Purchase	Unknown	Unknown	
	Unknown	2,600	Planned	2000	Unknown	
Libya	Unknown	440	Agreed to		Russia	Unknown
	Unknown	660	Agreed to		France	Unknown
Morocco (63)	A heavy water reactor is being built; uranium will be exploited in the eighties.					
Saudi Arabia (64)	For research	6	Negotiations	1977	France	Dhahrain
		No thinking of major reactors before the year 2000.				
Tunisia	Unknown	50	Planned	the 80's		Qabis

Title: Nuclear Expertise in the Middle East



Key:

1. The Soviet Union
2. Afghanistan
3. Pakistan
4. The Arabian Sea
5. Iran
6. Iraq
7. Syria
8. Israel
9. The Mediterranean Sea
10. Libya
11. Egypt
12. Saudi Arabia
13. In the process of being completed
14. Commercial reactor
15. Nuclear bomb capability
16. Nuclear plans
17. Research reactor
18. Technology enrichment plants

8592
CSO: 5100

INDIA

PROBLEMS, PLANS OF ATOMIC ENERGY DEPARTMENT TOLD

Bombay THE TIMES OF INDIA in English 15 Jul 80 p 6

[Article by K. C. Khanna: "Generating Atomic Power: The DAE's Ambitious Blueprint"]

[Text] AFTER a luckless decade, the department of atomic energy is again evolving brave new plans to harness nuclear power to the tasks of national development. The energy crunch, new discoveries of uranium and, above all, Mrs Gandhi's forward-looking policies have impelled it to think big. Indeed, in the face of growing international pressures to thwart its purposes, it has no other option.

Originally, Dr. Vikram Sarabhai's 10-year plan for the seventies envisaged ten reactors in all to raise the aggregate capacity of nuclear power stations in the country to 2700 MW by the end of 1979. In the event, the achievement totalled no more than 640 MW. In fact, the Tarapur Atomic Power Station was operational by 1969 end, except for the first unit of the Rajasthan Atomic Power Station (RAPS-I), not a single new reactor was commissioned during the entire decade. Hopefully RAPS-II will now go critical by the end of 1980 — more than seven years behind schedule.

A variety of factors apparently combined to make short work of the DAE's modest blueprint. These included labour unrest, infirmities of the industrial infrastructure and the inexperience of the nuclear scientists. Despite their boast that stoppage of foreign supplies following the Pokhran test in 1974 will have no appreciable effect on their ongoing programme, the embargo alone seems to have set it back by at least five years. Above all, their morale was at a low ebb due to the general indifference, if not the active hostility, of the Janata-Lok Dal governments to their endeavours.

REASSESS

Since the advent of the Congress (I) to power in New Delhi, however, they have begun to breathe a lot more easily. Their first impulse has been to reassess their earlier ideas in the light of experience and work out a new plan in a 20-year perspective. Just completed, it envisages that nuclear power stations will supply 10,150 MW of power — or 14 or 16 per cent of the total — by the end of the century.

The strategy they propose to adopt to attain this target is bold. Apart from the eight reactors that have been already completed or are abuilding at Tarapur, Kota, Kalpakkam and Narora, the DAE now plans to commission ten more of pressurised heavy water reactors (PHWRs) of the Kalpakkam type (235-MW capacity) between 1988 and 1994. Besides, it will design a 500-MW reactor of this very genre and commission as many as 12 such units between 1993 and 2001. That is not all. If all goes well, the country's first 500-MW fast breeder reactor, designed eventually to harness its vast reserves of thorium for power generation, may also begin to feed the national grid by the mid-nineties.

In essence, the DAE's new plan is an upscaled version of Dr Sarabhai's ill-fated plan in an extended time-frame. Apart from the four units at Tarapur and Kota, Dr Sarabhai had proposed the completion of another four 235-MW reactors by the end of 1977. These are still abuilding at Kalpakkam and Narora. He had also envisaged the completion of two 500-MW PHWRs by the end of 1979 to build up the requisite inventory of plutonium to fuel a number of fast breeder reactors in the nineties. These have failed so far even to get off the drawing boards.

Dr Sarabhai had proceeded on the assumption that a national commitment to his programme was necessary if it were to make the desired headway. He forcefully argued that industrial units in the country — BHEL, BHVP, Larsen and Toubro, Jyoti Engineering and so on — will be reluctant, if not unable, to manufacture equipment to the rigid specifications demanded by the nuclear power industry unless they have a run of orders for a number of years. For, it is not worthwhile for a firm to install jigs and tools for just one or two calandrias, end-shields, fuelling machines or control mechanisms; it must have repetitive orders to amortise its capital costs through sustained production. Nuclear scientists now say that the government's failure to commit funds for the DAE's earlier plan at "one go" has been a major cause of the excruciating delays in its implementation.

But it is difficult to assess the merits of this claim. For, in the new blueprint the DAE itself has provided nine and a half years for the completion of each 235-MW and 500-MW unit compared with only 5 or 6 years envisaged by Dr. Sarabhai. It may be that Dr. Sarabhai was over-ambitious. It is also true that, on present reckoning, the first unit of Kalpakkam would take about 13 years to complete. On the other hand, the first unit at Kota was completed in just about eight years and both units in Tarapur in no more than 62 months. The issue is further complicated by the fact that, thanks to greater concern for safety and consequential insistence on rigid quality control, the lead-time for the construction of nuclear power stations the world over (including the rich countries) now ranges between seven and ten years.

RESTRICT

Even so, it should be possible for the DAE to restrict the gestation period of its new units to eight years or less if it can get the kind of long-term financial commitment it seeks and also put its own house in order. In its earlier years it had often shown enviable capacity for innovative project management. For instance, it commissioned the country's first experimental nuclear reactor — APSARA — in just one year and installed the plutonium separation plant at astonishingly low cost in about three years. More recently, it organised the Pokaran test in less than 18 months from the word "go" despite the need to keep all preparations covered under an impenetrable blanket of secrecy.

The DAE's track record in managing the construction of its power and heavy water plants, on the other hand, has been lacklustre. Indeed, even its new 100-MW research reactor at Trombay is several years behind schedule. Obviously, the rules and procedures its departmental undertakings are forced to adopt under the existing regulations are not suited to the execution and operation of large industrial projects. Some 8000 men, including 1200 engineers and 2,000 qualified technicians are working at the moment in its Power Projects Engineering Division alone. It would be self-defeating to saddle PPED with the gigantic task of implementing the DAE's new plan without converting it into a business-like, autonomous corporation.

While the fate of this proposal is still up in the air, the DAE plans to put up in the future four-unit stations instead of two-unit ones as hitherto, to save both money and time. Thus two more PHWRs of 235-MW each will be erected at Narora in addition to the two already planned and four reactors of a similar capacity will be commissioned at each of the two new sites in Gujarat and Karnataka, respectively. Similarly, its 500-MW stations in the western, southern and northern regions will have four reactors each. This is because the required manpower is always difficult to assemble at any given location and its utilisation can be optimised by having as many units there as possible subject only to the requirements of the grid.

COMPETITIVE

While the DAE's proposals have been generally well received in principle in both the Union ministry of energy and the Planning Commission the problem of funding and phasing remains to be tackled. If its 20-year plan is accepted, a sum of Rs. 2,470 crores will be required to feed it during the next five years (1980-85) alone. For, apart from the direct outlay on power projects, considerable expenditure will have to be be incurred on ancillary facilities like heavy water plants or extraction and processing of uranium ore as well as research, design and development. The DAE's new cost estimate (based on mid-1979 prices) compares with the provision of Rs. 1150 crores in the defunct 1978-83 plan prepared by the former Lok Dal government (at 1978-79 prices) in December last. It raises two questions. Is it desirable to spend so much money in the atomic power sector alone? And can the nation afford it? Besides, the capacity of the DAE to make good use of the provision it is seeking will have to be closely examined.

But there can be no doubt that the government must aim at stepping up its atomic power programme in line with the country's basic resources, uranium reserves and the trained manpower on tap. As it is, nuclear power is fully competitive with coal-fired stations in areas at a distance of 800 km. or more from coal mines. Besides, fuel costs, which are affected by inflation, account for only 25 per cent of the total cost of generating nuclear electricity compared with 60 per cent or more in the case of coal-fired stations.

CSO: 4220

TARAPUR PLANT POSES SERIOUS SAFETY PROBLEMS

Kuala Lumpur BUSINESS TIMES in English 18 Aug 80 p 6

[Article by Sumanta Banerjee in New Delhi]

[Text]

WHILE the US Congress is still debating over President Carter's decision to send 38 tons of nuclear fuel to India's nuclear reactor at Tarapur, the plant itself is becoming an embarrassment for the government.

In the words of one observer, the Tarapur plant has become an "atomic monster," threatening the safety of Indians working there and those living nearby. The plant is located in western India.

The reasons: inadequate radiation control and decontamination facilities, a series of accidents (or what in nuclear terminology are described as "incidents") and the irresponsible way of disposing radioactive wastes.

American legislators favouring Mr Carter's decision hope to keep India away from the Soviets by supplying the fuel. But others fear the country will use it for making nuclear bombs. A few among them are concerned about the environmental and health hazards posed by the Tarapur plant.

The latest "incident" was a leak in the plant last March 14. Despite efforts by the Indian Atomic Energy Department to hide or underplay the accident, news of the leak — which had all the potentials of a major disaster — emerged.

In the face of persistent opposition questioning, the government had to admit in Parliament that the "incident" did take place at Tarapur. The official version of the accident did not reveal in detail the cause of the leak.

But sources close to the plant disclosed that radioactive water from the core in the coolant system of Tarapur's Unit , gushed out of a 15-centimetre tube.

The water drained into the reactor building where maintenance personnel were working. The reactor core's water level began to fall and the emergency core spray had to be initiated to prevent the core from heating up.

Meanwhile, technicians at great risk pushed a temporary plug inside the open tube to stop the leak. In the process, they were sprayed by contaminated water.

Sources said at least 26 technicians were rushed to a Bombay hospital for check-up. Although authorities claim they were safe, it is medical knowledge that radiation effects are slow and often unseen. For instance, doctors have found that radioactivity gradually destroys the iron content of a victim's blood, ravages his skin cells and even adversely affects his capacity to procreate.

Nuclear experts say that any basic safety requirements demand a back-up device — in cases when the main device fails — for plugging possible leaks. In Tarapur, this was apparently absent. In other words, the plug for stopping the leak should have been in the right position instead of being manually placed by technicians after the leak.

The March 14 "incident" was not the first. Between 1975 and 1979, at least 300 people were affected by excessive radiation. A maintenance worker in the common chamber died of asphyxiation in 1970 when he was allowed to enter a nitrogen-inerted containment area without the prescribed safety equipment.

In the past 15 years, as many as eight scientists at the Bhabha Atomic Research Centre committed suicide. It is yet to be established whether these suicides were out of personal frustration or physical problems brought by radiation.

Part of the responsibility for the inadequacies at Tarapur could be blamed on General Electric (GE) of the US which built the plant. Some safety faults have been detected even before the plant's completion. When pointed out, GE, however, did not take steps to correct and adopt adequate safety measures.

Indian personnel at Tarapur complain that GE refused to give the blueprints, thus preventing them from carrying out necessary repairs.

That over-exposure to nuclear radiation is a real threat to Tarapur personnel was reported in late 1973 by Mr John Walker, chief start-up engineer of the San Francisco (USA) Power Division, who visited the plant.

He said: "During the last refuelling outage on Unit 1, which was completed in May 1973, a total of 1,800 Manrems (Rem, or Roentgen Equivalent Man, is the unit by which radiation exposure is measured) of exposure were received by Tarapur Atomic Power Project and Bhabha Atomic Research Centre personnel.

"This total exposure is the equivalent of 'burning out' 100 people for a year."

In a letter to US Congressman John Moss, US Nuclear Regulatory Commission official Lee Gossick pointed out that the average dose levels to Tarapur personnel during 1972-74 were "about twice the US level in those years."

He added that the level of radiation exposure among the neighbouring population in Tarapur from land, water and air sources are "higher than permitted under the US rule that radioactive effluents be 'as low as reasonably achievable'."

The mode of disposing Tarapur's radioactive waste, or radwaste, is one reason why nearby civilian populations are at risk. The bulk of the waste is thrown into the Arabian Sea on whose banks Tarapur is located. As a result, the region's fish population is dwindling. Local fishermen complain that while they could load at least seven truckloads of fish per day before, now they can hardly load one truck. — Depthnews

CSO: 5100

GANDHI REPORTS URANIUM FIND IN UTTAR PRADESH

New Delhi PATRIOT in English 10 Jul 80 p 1

[Text]

URANIUM occurrences have been discovered in Saharanpur district in Uttar Pradesh recently, Prime Minister Indira Gandhi said in the Lok Sabha on Wednesday, reports PTI.

In a written reply to Mr M V Chandrashekhara Murthy, Mrs Gandhi said the grade of the ore would be known only after detailed exploratory work.

Asked whether uranium ore found in Saharanpur was better than that of Jaduguda, Mrs Gandhi said comparison was not possible at this stage.

Mrs Gandhi also said the fuel for Rajasthan and Madras Atomic Power Projects had been indigenously fabricated from Indian raw material.

A feasibility study based, among other things, on the report of the site selection committee, for proposed atomic power stations in the country, was being processed for Government's approval, the Prime Minister said in a written reply to Mr Ramjibhai Mavani.

She said the site selection committee, appointed by the Government in 1970, examined various sites. In the western electricity region, which included Gujarat, the committee had recommended some sites, she added.

Answering another question, Mrs Gandhi said that there was no proposal to have an atomic power plant in West Bengal, adds UNI.

HEAVY WATER

About the prospect of producing heavy water within the country, the Prime Minister said that the process technology employed at the heavy water plants at Tuticorin and Baroda, namely ammonia-hydrogen exchange (monothermal) has already been proved successful as production of heavy water has been achieved. Heavy water plant (Talcher) which is based on ammonia-hydrogen exchange (bi-thermal), is likely to be commissioned shortly as soon as synthesis gas is available from the Fertiliser Corporation of India, Talcher. The Kota Plant has H2S-H-20 process, which is a well established process elsewhere in the world. This plant is expected to be commissioned by November, 1981.

The designed capacity of the four heavy water plants under construction is about 300 tonnes per annum. It would not be in the country's interest to disclose the actual or estimated production of heavy water from these plants.

CSO: 5100

BRIEFS

INDIAN NUCLEAR CENTER--The Bhaba Atomic Research Center at Bombay has developed a system for monitoring power plant equipment. The unit, called disturbance analyzer, has been designed for fault analysis in the nuclear power station at Kotah in Rajasthan. Such analyzers can also be used for thermal power stations. [Text] [BK161042 Delhi General Overseas Service in English 1000 GMT 16 Sep 80]

CSO: 5100

INDONESIA

FRENCH NUCLEAR COOPERATION OFFERED

Jakarta HARIAN UMUM AB in Indonesian 5 Jul 80 pp 1, 3

[Article: "Indonesia Has an Acute Desire to Construct a Nuclear Power Plant"]

[Excerpts] Indonesia has an acute desire to construct a nuclear power plant to fill future industrial needs for electricity, although there is a generally decreasing tendency worldwide to build such plants.

The French High Commissioner for Nuclear Energy, Professor Jean Teillac made this statement in a press conference at the French Embassy in Jakarta on Friday during his five-day Indonesian visit that began last Tuesday.

Professor Teillac is in Indonesia as a result of French-Indonesian cooperation in the nuclear field. While in Jakarta, he is holding discussions with the Minister for Research and Technology, Professor Habibie, the Minister for Mining and Energy, Professor Subroto, and key officials of the National Atomic Energy Agency.

An agreement relating to the nuclear cooperation between the National Atomic Agency and the French Atomic Power Commission, was just signed in Paris last April by the director general, Professor Barquini and Professor Teillac, in the latest of a series of accords between the two agencies that go back ten years. This agreement for cooperation in the nuclear field is part of the cooperative treaties between Indonesia and France in the fields of culture, education and technology.

The new agreement encompasses several specialized fields such as nuclear safety, protection from radiation, assembling studies in physics and chemistry and the use of radio isotopes. The earlier agreements provide for cooperation, among other matters, in the exploration for uranium in Kalimantan.

According to Professor Teillac, the exploratory efforts in Kalimantan which have been underway for about ten years, have uncovered some uranium sediments. However, economic exploitation would not be profitable because of the difficulty of extraction.

France has offered a laboratory and testing reactor for the Center for the Development of Education and Technology and has indicated a willingness to train Indonesian personnel. It has also expressed great interest in constructing a nuclear power plant if such an installation is built in Indonesia.

According to the French High Commissioner, it would be preferable for Indonesia to construct several small-scale nuclear power plants rather than a single large one, in order to limit the dimensions of any potential accident that might occur.

According to a feasibility study conducted by Italy some time ago, it would be better for Indonesia by 1989 to operate one nuclear power plant with a capacity of 600 megawatts to meet industrial needs for electricity in Java. This plant should be located in the region of Lasem, Pati, in central Java.

The Director General of the National Atomic Energy Agency, Professor Baiquini, said in his present statement that if Indonesia is to have a nuclear power plant in operation by 1989, a decision by the government had to be made this year.

France at the present time already has fifteen nuclear power plants, each with a capacity of 900 to 1,300 megawatts. It will continue to build such plants at the rate of one every two months, so that by 1985 there will be a total of 40 with a combined capacity of 40,000 megawatts. This output will fulfill about 50 percent of its electrical needs. By the year 2000, it is anticipated that eighty five percent of France's electrical needs will be met by nuclear power plants.

9464
CSO: 5100

HIGH QUALITY URANIUM DISCOVERED

Jakarta KOMPAS in Indonesian 15 Jul 80 p 12

[Article: "High Quality Uranium Discovered in Pringating"]

[Text] Dr of Engineering Johanes declared with certainty that there were Uranium deposits in the area of Pringating, Ruing Subdistrict, Ngada District, Province of East Nusa Tenggara. He made his statement upon the completion of a four-hour survey in the field last Friday.

Governor Ben mBoi who received the above information stated that Professor Johannes had decided to investigate the region of Pringating after receiving a report from Cesarius Castillo, an applied geologist from Kupang, who returned from the area at the end of June. At that time, using a geiger counter, an instrument that measures radioactivity, Castillo conducted a survey of some marble strata in Ruing. In a manner that was unforseen, he heard audible sounds from his equipment, signaling the emission of radioactive waves. The geiger counter that he used had been given by the director general of the National Atomic Energy Board to the provincial government of East Nusa Tenggara, after Castillo encountered uranium deposits at Bukit Setan last May.

A scintillation counter, an instrument to record radioactive emissions, owned by Professor Johanes, verified Castillo's discovery. This instrument registered a reading of 30-50 (sic) over normal at 175 places where measurements were taken. The tests were conducted over an area of about 200 square meters, and from a moving vehicle so that the equipment would not be in contact with the ground. From this field investigation, it was concluded that the uranium discovered was of a very high quality.

Castillo's report, which was remitted to the governor of East Nusa Tenggara at the end of June, and which attracted the attention of Professor Johanes, mentioned the discovery of granular diorite, granite and andesite deposits, of which the eroded topmost layers were colored yellowish brown and green. In several places, malachite sediments were discovered as deposits of porphyritic structure in the eroded igneous rocks. This indicated the presence of uranium at a depth of 20-30 meters.

Professor Johannes, according to Ben mBoi, verified Castillo's data and reported the discovery to Minister for Development and Environmental Control Emil Salim, who landed in Ende (Flores) last Saturday. According to Castillo's estimates, there are also uranium deposits of equivalent quality in the area of Runtal near the border of Ngada and Manggarai, where the mineral composition appears to be the same as that in Pringating.

Governor Ben mBoi told Kompas last Monday that a complete report on the Discovery of the uranium deposits would be sent as quickly as possible to the president and the minister for mining and energy. This week, Castillo will undertake boring and digging to obtain samples for the report. According to Ben mBoi, the Pringating discovery is consistent with the conclusions of an Atomic Energy Agency investigative team which carried out exploratory work at Bukit Setan. From the exploration of this area, the Atomic Energy Agency drew two conclusions.

The first is that the geology of Timor is not as simple as originally believed. There is much that needs to be investigated. Among other matters, the uranium deposits at Bukit Setan and the granite extrusions at Atapupu lead to a disparity of conclusions about the geology of Timor. Second, the Atomic Energy Agency is recommending a survey to search for uranium deposits in central Flores, where the area of Pringating is located. It is to conduct surveys of this type that the Atomic Energy Agency presented a geiger counter to the regional government of East Nusa Tenggara. It was this instrument that was used recently by Castillo in his investigations.

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CSO: 5100

KARTINI ATOMIC REACTOR IN YOGJAKARTA DESCRIBED

Jakarta HARIAN UMUM AB in Indonesian 26 Jul 80 pp 4, 9

[Article by Setyo Utomo Said M.S.: "Kartini Atomic Reactor Built from Domestic Resources"]

[Excerpts] A domestic atomic reactor successfully built by local manpower was inaugurated by President Soeharto on 1 March 1979.

The installation, which is used for educational needs, training and research, was given the name "Kartini Atomic Reactor" in sole commemoration of the ideals of the national heroine, R.A. Kartini.

The atomic reactor, which has a capacity of 100 kilowatts, is the first reactor whose entire planning and construction was carried out by Indonesian experts and technicians without any assistance by foreigners.

Long before the reactor was built, field research and tests for environmental radioactivity were carried out. This included measurements of radioactivity which accompanies rain, morning dew and dust, plus that found in well, river and (biota) water, in grass and on the ground, within a radius of five kilometers from the site where the reactor was to be built. The purpose of such measurements was to obtain data concerning environmental radioactivity in the immediate vicinity of the reactor site, so that later it could be compared with the natural radioactivity of a similar area, after the reactor was built and began operating. In this manner, it would be possible to detect any changes in environmental radioactivity as a result of the presence of an atomic reactor in the vicinity.

The size of the Kartini Atomic Reactor covers an area of about 900 square meters. Part of the installation is three stories high. The vestibule of the reactor measures 20 meters square and is 12 meters high. It is partly covered with a flat roof and partly with a dome-shaped roof in the center.

The reactor tank is made of aluminum and is of cylindrical shape measuring 6.5 meters in height and two meters in diameter. The tank of the reactor is filled with distilled water so that the nuclear fuel at the bottom remains submerged under this water.

The nuclear fuel consists of 71 fuel elements having a 20 percent composition of uranium-235. The uranium fuel elements are in the shape of thin rods measuring 3.5 centimeters in diameter and 35.6 centimeters in length. These thin rods are placed within cylindrically shaped protective sleeves measuring 72 centimeters in length and 3.5 (sic) centimeters in diameter.

Besides the fuel elements, there are an additional seven rods whose protective sleeves are filled only with carbonized graphite which serves to reflect correctly the neutrons-neotrons (sic) what are traveling in a wrong direction. These graphite rods are called reflectors.

There are also three control rods whose shape resembles that of the fuel rods. The protective sleeves of the control rods are filled with boron carbide which serves to absorb superfluous neutrons.

To initiate a core chain reactor in the fuel elements of the nuclear reactor, a source of neutrons is required. In this respect, the Kartini Atomic Reactor has a source of neutrons whose shape is similar to that of the fuel rods and which is made of plutonium-beryllium.

The fuel rods, the graphite rods, the control rods and the plutonium-beryllium rods are installed upright in a reactor core. This reactor core consists of a stainless steel cylinder with a double casing filled with graphite which serves as a neutron reflector. The height of the cylinder measures 56 centimeters; the diameter of the outer casing measures 110 centimeters; the diameter of the inner casing measures 92 centimeters.

The upper and lower ends of the reactor are covered with flat, disk-shaped pieces measuring 50 centimeters and perforated with a series of small holes through which pass the fuel rods. These flat, disk-shaped pieces are called the upper and lower gratings.

The reactor tank is covered by a shield of reinforced concrete composed of stones and granular barite, giving the entire mass great weight. The shield, which is 6.5 meters in height, has a foundation sunk six meters into the earth and was planned to be earthquake-proof. The reactor shield is 2.5 meters thick and weighs 600 tons. With a shield of such thickness and weight, it is calculated that radiation occurring within the reactor core will not leak out of the reactor tank.

In the cooling system, distilled water in the reactor tank is pumped out through a series of pipes passing through a cylinder filled with cold water and then pumped back again into the tank. The circulation of the distilled water to cool it through a closed system of pipes is called the primary system. The water which is used to cool the distilled water travels through its own system of pipes so that it will not mix with the distilled water of the reactor tank. The circulation of the water which cools the distilled water is called the secondary system. Because this cooling water will also become warmed up, it is pumped in a spray in the open, outside the reactor building. For this reason, a cooling pool with fountains in its midst was constructed on the grounds of the reactor building. The fountains spray the water from the cooling system into the air.

The rooms in the reactor building are kept tightly closed so that the air within these spaces is expelled from the building by means of special vacuum pumps. The air that is sucked out in this manner is later released into the open atmosphere after passing through a ventilation tower 32.5 meters in height. In the lower part of the tower there is a filter to remove or trap the radioactive gases generated in the reactor building. In the meantime, clean air enters the reactor building through ventilation louvers in the walls.

In the Kartini Atomic Reactor, there are four conduits to channel the flow of neutrons. Neutron energy that passes through these conduits is not identical.

In addition to the four conduits for the neutron flow, there are two other places through which the neutrons originating in the reactor core must pass. These two places are built in such a way that the energy of the neutrons passing through them will be sharply attenuated. Such neutrons whose energy has been dissipated are called thermal neutrons, and the places through which the neutrons pass are called the thermal column. The way to transform energy-laden neutrons moving at a high rate of speed into thermal neutrons of diminished intensity is to pass them through a specified material called a moderator. In the thermal column of the Kartini Atomic Reactor, boral-graphite is used as the moderator.

9464
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SCIENTIST CLAIMS THAILAND CAN DEVELOP OWN NUCLEAR TECHNOLOGY

Manila PHILIPPINES DAILY EXPRESS in English 30 Jul 80 p 24

[Article by Wirasak Salayakanond: "Self-reliance in Nuclear Technology Urged"]

[Text] Bangkok--Thailand might be exporting its valuable uranium without knowing it.

From a simple laboratory in this city's elite Chulalongkorn University comes the argument that substantial quantities of uranium-bearing mineral lode are being taken out of the country as ordinary minerals.

Prof. Suwan Saenpetch, chief of the university's nuclear technology division, claims that some of the copper and tin exported contain uranium and thorium--raw materials for fuelling nuclear reactors and used in nuclear bombs and nuclear research.

The 55-year-old scientist, who has spent the last 10 years conducting extensive research on nuclear technology, and his young staff have just fabricated the Kingdom's first uranium pellet using homespun technology with no financial or technical help from the government or energy-related research insitutions.

He told DEPTHNEWS SCIENCE the laboratory-developed pellet is similar to those used in nuclear reactors.

Says Prof. Suwan: "What we have done in our simple laboratory shows that Thailand can develop the technology from extracting the radioactive minerals right up to building our own reactors."

The outspoken scientist says he would like to see an orderly development of nuclear technology in the country. However, he cautions that "a decision must be made on whether Thailand wants to use nuclear energy. And that decision must be made by the people, not by the government, not by the energy authority, and certainly not by commercial companies interested in making a profit."

Thailand should think of moving to nuclear energy in about 20 years, he says, because it has other alternative sources of energy good for at least two decades more.

These alternative energy sources include natural gas ("which must be used sparingly as it is the most valuable hydrocarbon material Thailand has"), lignite and oil shale.

Prof. Suwan believes that suitable preparations to move into the nuclear energy phase should be planned now but that the country must think independently in working out future programs.

He warns against overdependence on foreign assistance or even collaboration. "Look what happened to us in the case of the petroleum. We already have one noose around our neck and we should not put another once we take out the petroleum noose."

Suwan insists that Thailand has the necessary technology to develop nuclear energy and that there are sufficient quantities of radioactive minerals in the country from which uranium and thorium can be extracted.

He disclosed that several locations in the country contain mineral deposits with a high degree of uranium content. The largest such site is believed to be in Khonkaen province in the northeast and some identified spots in Northern Thailand where the uranium content of the mineral lode has been shown to be extremely high.

According to Thai scientists, there are at least six confirmed sites--Kanchanaburi and Uthai Thani in the central plains, Rayong near the former United States airbase in Sattahip on the eastern coast, Khonkaen and Songkhla in the south, and in the southern island of Phuket.

CSO: 5100

POWER PLANT CONSTRUCTION, URANIUM EXTRACTION PROGRAMS (1980-1995)

Rome NOTIZIARIO COMITATO NAZIONALE PER L'INDUSTRIA NUCLEARE in Italian Jun 80 pp 57-59

[Article by Maria Luisa Perilli, Maria Magda Sansone: "Research and Construction Developments in the Brazilian Nuclear Program"]

[Text] According to a recent announcement by the president of NUCLEBRAS [Brazilian Nuclear Corporations], Baptista, the national nuclear program will receive a new impetus following the difficulties that have considerably delayed its activation.

The announcement stated that two new power plants will be built starting in 1980, for which an expenditure of $44 million has been provided in this year's budget.

These two units will be the fourth and fifth ones planned under the national program, and the third and fourth ones contemplated in the cooperation agreement signed with the FRG [Federal Republic of Germany] in 1975 (see NOTIZIARIO 21, 20, July 1975). That agreement , which is thus confirmed, provided for the construction, by the year 1990, of eight power plants, each with a capacity of 1,200 MW(E), and for the construction of a uranium enrichment plant, a fuel production plant and a fuel reprocessing plant.

The scheduled completion of the program has been slipped 5 years to 1995 because of the economic problems that have arisen recently.

The country's soaring inflation has given rise to drastic economic measures: NUCLEBRAS, a state-owned enterprise, has had its budget cut back sharply.

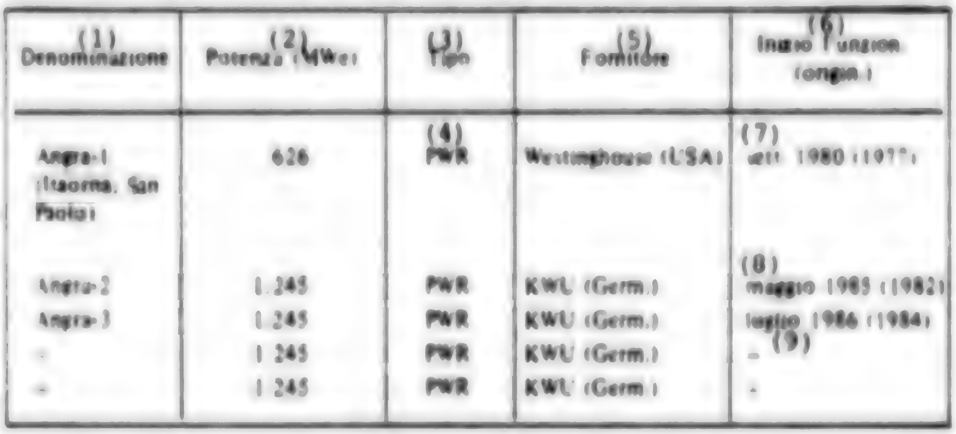
According to NUCLEBRAS's most recently announced decisions, $220 million have been put into the budget for completion of the first Angra dos Reis unit and preliminary work for Angra-2 and Angra-3. As regards the latter the site, originally planned to be 100 meters away from Angra-2, will probably be relocated to 800 meters away, owing to the presence of huge lithoidal masses in the subsurface.

For the same reason, it has been decided to reinforce the foundations of Angra-2; spokesmen for Centrale Electricas de Furnas, the company that will take over and operate the plants, have announced that the KWU [Power Plants Union] and NUCLEN [NUCLEBRAS Engineering, Inc] (a German-Brazilian nuclear construction firm) have completed the planning of this work.

This work, which was to have been completed in 1979, was instead only started this year. Because of the delay, $326 million must be added to the project, of which only $6 million represent actual construction cost and $240 million interest charges; the remaining $80 million are to cover the cost of new programing of equipment and materials deliveries for Angra-3.

At this point in time, the situation as regards the country's nuclear power plants can be summarized as in Table I.

Table 1: Power Plants Under Construction and Planned in Brazil



(1) Denominazione	(2) Potenza (MWe)	(3) Tipo	(5) Fornitore	(6) Inizio funzion. (origin.)
Angra-1 (Itaorna, San Paolo)	626	(4) PWR	Westinghouse (USA)	(7) sett. 1980 (1977)
Angra-2	1.245	PWR	KWU (Germ.)	(8) maggio 1985 (1982)
Angra-3	1.245	PWR	KWU (Germ.)	luglio 1986 (1984) (9)
-	1.245	PWR	KWU (Germ.)	-
-	1.245	PWR	KWU (Germ.)	-

Key:

1. Designation
2. Power capacity (megawatts electric)
3. Type
4. Pressurized-water reactor
5. Supplier
6. Start of operation (originally scheduled)
7. September 1980 (1977)
8. May 1985 (1982)
9. July 1986 (1984)

Uranium Resources

Over the last 10 years, there has been a steady and substantial development of the uranium exploration and production sector in Brazil.

In terms of figures, proved reserves have been increased from 1,000 tons of U_3O_8 in 1970 to 74,200 tons in January 1979.

Production, which was zero until the end of 1978, was projected at 103 tons of uranium concentrate in 1979.

Production capacity, according to constantly rising projections, should stabilize at around 970 tons a year of uranium from 1983 through the end of 1987, which will be ample to meet its own domestic needs.

Uranium exploration in Brazil started in 1952. From then until 1960, exploration was carried on by the Brazilian CNEN [National Nuclear Energy Commission] in cooperation with the United States. During the period 1962-1966, characterized by cooperation with the French CEA [Atomic Energy Commission], the Pocos de Caldas uranium deposit in the state of Minas Gerais was discovered. Most of the reserves in this zone and in Figueira, state of Parana, were proven between 1970 and 1975.

The beginning of the 1970's was the start of the second phase of uranium activity in Brazil--the first phase had spanned the period 1952-1970--with the intensification of explorational programs and significant financial investments.

In 1974, NUCLEBRAS was formed to explore for, extract and process uranium ores.

In 1975, NUCLEBRAS signed a cooperation agreement with the Urangesellschaft (FRG) and formed NUCLAM [NUCLEBRAS Mining Assistance, Inc] to explore for and extract uranium in several mining concessions. It was NUCLAM that discovered the Esphinharas uranium deposit in the state of Paraiba, with reserves estimated at 4,200 tons of U_3O_8.

Also in 1975, Brazil signed an agreement with Canada covering geophysical explorations.

Brazil's considerable uranium explorational program has yielded, to date, eight major deposits listed below. Of these, the Itataia deposit in the state of Ceara, discovered toward the end of the 1970's, was the determinant factor, with its estimated 40,700 tons of proved reserves of U_3O_8, in Brazil's sharply increased uranium reserves (Table II and Fig. 1):

--Pocos de Caldas (state of Minas Gerais): 17,000 tons of U_3O_8 reserves; average U_3O_8 content: 0.34 percent; under exploitation.

--Figueira (state of Parana): 5,900 tons of U_3O_8 reserves; the uranium is associated with Mo, Pb, Zn and Cu.

--Ganderala and Serra das Gaivotas (state of Minas Gerais): 4,200 tons of U_3O_8 reserves; situated in the "Iron-ore Quadrangle"; pyrite is present in the mineralization at a concentration of 5-20 percent.

--Amorinopolis (state of Goias): 1,700 tons of U_3O_8 reserves.

--Campos Belos e Rio Preto (state of Goias): 400 tons of U_3O_8 reserves.

--Itataia (state of Ceara): 40,700 tons of U_3O_8 reserves; currently Brazil's richest uranium deposit.

--Lagos Real (state of Bahia): reserves are minor; uranium content varies between 850 and 6,800 ppm.

--Esphinaras (state of Paraiba): 4,200 tons of U_3O_8 reserves; average uranium content is around 0.07 percent.

At the Pocos de Caldas deposit, the only one now being exploited, NUCLEBRAS has installed a uranium ore processing plant that was scheduled to become operational in 1979 with a projected production of 103 tons of concentrate. Production capacity, according to constantly rising projections, should stabilize at around 970 tons a year of uranium from 1983 through the end of 1987, which will be ample to meet its own domestic needs (Tables III and IV) [Translator's note: As published, this sentence repeats verbatim a one-sentence paragraph on previous page, except for reference to Tables III and IV].

Thorium Reserves

Brazil is one of the world's leading nations as regards thorium reserves.

Based on the most recent evaluations, proved reserves total 68,000 tons of thorium, situated in the state of Minas Gerais at Araxa (33,000 tons) and at Caldas (35,000 tons).

In addition, in the Araxa zone, probable reserves have been calculated to total 1,200,000 tons (Table V).

Under the nuclear cooperation agreements between Brazil and the FRG signed in 1978, the use of thorium as a nuclear fuel has also been considered.

Table 2: Brazil's Uranium Reserves (January 1979)

(1) t di U_3O_8			
(2) Risorse ragionevolmente assic.		(3) Risorse addizionali stimate	
< 80 $/Kg U	80-130 $/Kg U	< 80 $/Kg U	80-130 $/Kg U
17000 [a]		5800	
5900 [b]		800	
4200 [c]		8500	
1700 [d]		2500	
400 [e]		400	
40700 [f]		63200	
– [g]		4700	
4200 [h]		4200	

a. Poços de Caldas – MG.
b. Figueira – PR
c. Quadrilatero Ferrifero – MG.
d. Amorinopolis – GO.
e. Campos Belos – GO
f. Itataia – GI
g. Lagoa Real – BA
h. Espinharas – PB

TOTALE: 74200 et 90100 t rispettivamente
(4)

Key:

1. Tons of U_3O_8
2. Proved reserves
3. Probable reserves
4. Total: 74,200 and 90,100 tons respectively

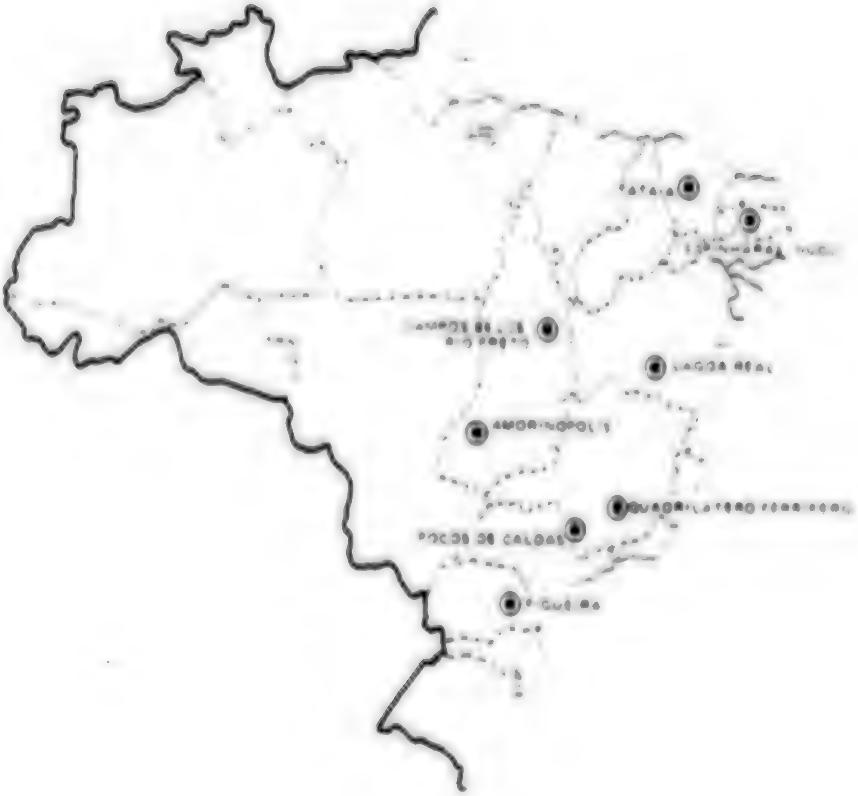


Fig. 1. - Brazil: Locations of uranium deposits

Table 3: Uranium Production

(1) Anni		(2) t di U (sotto forma di concentrati)
(3) prima del	1975	
	1975	
	1976	
	1977	
	1978	
	1979 *	103

* Previsioni (4)

Key:

1. Year
2. Tons of uranium (concentrate)
3. Before
4. Projected

Table 4: Production Capacity and Domestic Needs

(1) Anni	(2) t di U	
	(3) Capacita di produzione prevista	(4) Fabbisogno interno
1979	103	13,1
1980	510	106.0
1981	510	103.5
1982	810	93.7
1983	970	92,0
1984	970	207.8
1985	970	311.6
1986	970	513.9
1987	970	696.2
1988		
1989		
1990		

Key:

1. Year
2. Tons of Uranium
3. Projected production capacity
4. Domestic needs

Table 5: Brazil's Thorium Reserves

(1) Ubicazione	(2) t di Th	
	(3) Riserve ragionevolmente assicurate	(4) Riserve addizionali stimate
Araxá – Stato di Minas Gerais	33 000	1 200 000
Poços de Caldas – Stato di Minas Gerais	33 000	

Key:

1. Location
2. Tons of thorium
3. Proved reserves
4. Probable reserves

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NUCLEBRAS HEAD DISCUSSES COUNTRY'S NUCLEAR PROGRAM

Sao Paulo VISAO in Portuguese 11 Aug 80 pp 20-24

[Interview with Paulo Nogueira Baptista, president of the Brazilian Nuclear Corporation (NUCLEBRAS), in Rio de Janeiro, date not given]

[Text] Is Brazil building an atomic bomb? If not, why such insistence on building nuclear power plants? Why are the scientists left out of the nuclear program? Where is the atomic waste going to be stored?

The president of NUCLEBRAS, Ambassador Paulo Nogueira Baptista, spoke to a team of reporters and editors of VISAO for 3 hours in his office in the Brazilian Academy of Letters Building in Rio, seeking to clarify the doubts about the Brazilian nuclear program. It is the first exclusive interview of this scope granted by the NUCLEBRAS president.

[Question] Does Brazil intend to build an atomic bomb?

[Answer] Brazil's position of principle is that we should have wide access without restriction to all nuclear technology, including that for the production of nuclear devices for peaceful purposes. It was and is prepared to accept safeguards. Brazil never had any intention of building the bomb. There is a technical difference between a bomb and a device for peaceful purposes.

[Question] Does that device explode?

[Answer] It explodes to open canals, for example, to facilitate the exploration of natural resources.

[Question] Why did Brazil not sign the Treaty on Nonproliferation of Nuclear Weapons?

[Answer] Basically, Brazil does not accept the nonproliferation treaty because it considers it unbalanced in terms of duties and obligations. The countries possessing nuclear weapons make very small commitments and they ask the nonnuclear countries to make very great commitments.

[Question] The opponents of the Brazilian nuclear program declare that the cost per nuclear kilowatt is triple that of a hydroelectric kilowatt. Is that true?

[Answer] It is not true. The statement is nonsense, absurd. Each hydroelectric plant has a different cost, since it cannot be measured only by the cost of production at the dam due to the different distances from consumption centers.

[Question] Even if the transmission cost is very high, doubling the cost per kilowatt from $1,000 to $2,000, it would be less than the $3,000 per nuclear kilowatt....

[Answer] We do not accept the cost of $3,000 for a nuclear kilowatt. The hydroelectric plants already in operation are the cheapest, the best. It was logical to begin with the closest, the cheapest. Now hydroelectric costs are progressively increasing. Today the cost of the hydroelectric plants under construction is already much higher than that of the plants in operation, in fixed currency. The cost of Itaipu is going to be 2 and a half times greater than that of Furnas. That tendency is intensifying as we move away from consumption centers and utilization becomes more difficult. Nuclear energy is certainly more expensive than that from the hydroelectric plants already built; it is even more expensive than that of the hydroelectric plants under construction, though not all of them. It will not be more expensive than that of the large number of hydroelectric plants yet to be built.

[Question] Of the hydroelectric plants under construction, which is more expensive than a nuclear plant?

[Answer] I cite, for example, Balbina in Amazonas, estimated at between $2,000 and $2,500 per installed kilowatt. Besides, it is necessary to take into account also the cost of steady energy, because the load factor enters into it. In Brazil normally a hydroelectric plant uses only half of its nominal capability. With a nuclear plant, that average runs above 70 percent. Balbina is going to operate with an average factor of 32 percent, which triples the per kilowatt cost.

[Question] Would you say that the cost per nuclear kilowatt is competitive with that of hydroelectric energy?

[Answer] It will be; with that of the programmed plants.

[Question] It is said that we do not need nuclear energy at the present time. Professor Jose Goldemberg says that we could wait 20 years and then use much more advanced technology.

[Answer] As a matter of fact, the problem of need is much more important than the problem of the cost of energy. In the final analysis, we are going to pay the necessary price. The most expensive energy is the one that does not exist. The decision on nuclear energy is related more to the lack of alternatives than to cost, properly speaking. Of the presently available energy sources, we must exclude oil at the outset. We do not have coal in sufficient quantity and quality, besides the fact that coal has more efficient alternate uses. Basically, we have water and uranium, natural resources.

[Question] But we import yellow-cake (uranium concentrate), do we not?

[Answer] No. We only imported the first charge for Angra-1. Today, Brazil ranks sixth ranking in the world in uranium reserves. The quantity already confirmed is sufficient for the whole useful life of 35 plants of the Angra-2 type; 35 plants for 30 years. Why leave that resource underground and continue to import energy? We have to use water and uranium, which are national resources. Brazilian hydroelectric potential is estimated today at 212,000 megawatts, with 105,000 megawatts of steady energy. Brazil is operating 30,000 megawatts and building another 35,000. That is, we are growing at a rate in excess of 10 percent per year, doubling consumption every 7 years. That is the time period for construction of a plant. Therefore, in a given year, we should be building as much as we already have in operation. At that rate, we would be building 65,000 megawatts in 1994. It will be 130,000 megawatts in the last decade of this century, at which time the Brazilian Electric Power Corporation (ELETROBRAS) anticipates a drop in the growth of consumption. Let us increase the doubling period to 10 years. Then by 2004, we will need 260,000 megawatts and the reserves will be completely exceeded, even if they are fully utilized.

As a matter of fact, it is unlikely that we will exceed 75 percent of our potential because part of it is unusable in technical and economic terms. Let us, therefore, accept the most optimistic position: 10 percent utilization of the hydroelectric potential and all transmission problems resolved. Once the hydroelectric potential is exhausted, which will be in 2002, 2003, 2004?...

Let us say that the increase of consumption falls drastically to 5 percent per year. Then we will have to build a new Itaipu per year, but there will be no more water. That is why we have to resort to the atom, isn't that right? But the construction of a nuclear plant has to be decided 10 years in advance. If we started in 1991, we would have to begin the construction of 12 nuclear plants per year. Suddenly, starting from zero.

Do you think that is a reasonable plan? I used round numbers but based on ELETROBRAS' consumption projections. I will give you another approximation of the same problem. France is a good standard because it does not waste energy as the United States does. It has the equivalent of 1 installed kilowatt per capita; 50,000 megawatts for 50 million Frenchmen. If we reach that level by the year 2000, we will have the French standard of 1980. We will have a population of 220 million and will need 220,000 megawatts, which would be 100 percent of the theoretically useable potential.

ELETROBRAS projections are not exaggerated. As a matter of fact, Angra-2 and -3 have been delayed and will not go into operation until the latter part of the eighties. The Southeast Region (Rio and Sao Paulo) depends exclusively on Itaipu, which is scheduled to go into service in 1982. The project is going along very well and running like a clock. But it is a huge project that is introducing new machinery of a size never used before, and some problems can arise. It would not be at all extraordinary. In that case, we would be left hanging because there has already been a delay in delivering the nuclear plant. So, you can see that government planning is a sort of relay race. Nuclear energy will be coming in slowly, growing, while hydroelectric energy will be declining until nuclear energy can assume the major responsibility.

There is another serious problem: time. It takes 30 years to acquire perfect knowledge of a potential. We still need more than 20 years of observation of half of our potential, which is in the Amazon. Even granting total utilization economically and technically justifiable, we do not know if it would be available in 1994. That means that we need an alternative solution so that there will not be any rationing.

[Question] Is that why, at the inauguration of the NUCLEBRAS Heavy Equipment Corporation (NUCLEP) factory in Itaguai, President Figueiredo named a committee to prepare within 30 days a new 30-year plan for supplying Sao Paulo? The time period has expired and silence reigns; nobody talks about that. What happened?

[Answer] I am not responsible for that silence. The committee falls within the area of the Ministry of Mines and Energy. The information I have is that it is in the final phase of collecting data to present its report. But I do not think the plan requested by the president is due to the threat of rationing. I believe it arose because of the insistence of the government of Sao Paulo for the definition of an electricity program.

[Question] How is the transfer of technology going? Will it really not be complete until after the eighth plant, as the German ambassador stated? Is it true that persons were sent abroad who lacked sufficient prior preparation to enable them to assimilate it?

[Answer] The initial program is for eight nuclear plants based on an ELETROBRAS proposal at the beginning of the Geisel administration. I believe that even before those eight, we already will have acquired complete mastery in terms of nuclear power plant planning, construction, project management, the whole fuel cycle. I believe that by the fourth plant, we already will have complete mastery of the technology, that is, still in this decade. What the German ambassador wanted to say is that technology is transferred only through its full utilization. If we do not put the received technology into practice, do not establish it, it will be lost. Technology is an elusive thing.

The ideal thing would be to send to Germany people who are fully qualified. However, a technician at that level has already moved ahead in his career and is not in a position to enter another branch of engineering. For that reason, we had to opt for someone who is beginning. Training takes 5 to 6 years and at the end of that period the technician is fully qualified.

[Question] Why were private companies not invited to assimilate that technology?

[Answer] They were invited but as subcontractors. The basic plan is being transferred to the NUCLEBRAS Engineering Corporation (NUCLEN). What the private sector will do is the detailing. It would be unthinkable to obtain a foreign supplier who would open up his basic plan to private companies, which could later be purchased by competitors.

[Question] Westinghouse sold to KWU.

[Answer] It did. But the situation of Germany in relation to the United States is not the same as that of Brazil in relation to Germany. And that is not what we are doing. Westinghouse selected a firm in Germany for that and it did not grant anything to any other company. And that firm had all the government support, a de facto monopoly in the nuclear project area. Why do you insist that technology should be transferred to a private company?

[Question] According to the constitution, it is the function of private enterprise to exploit the economy.

[Answer] If it is in a position and has the capability to do so. Which is the private company that is so privileged? NUCLEN has the function of developing plans that cannot be handled by private enterprise. NUCLEN is doing to operate as a monopoly.

[Question] Is its objective then to be a monopoly?

[Answer] With relation to the basic plan, it is monopolistic.

[Question] What is the total cost of the nuclear program today in current dollars?

[Answer] In 1980 dollars, the figure amounts to $17 billion, only 20 percent of which is in foreign currency.

[Question] Is it true that KWU has the power of veto in NUCLEN?

[Answer] That is not quite true. It is not a matter of a power of veto. We agreed to take certain decisions by unanimous vote, which is absolutely normal. If we do not want to observe the rule, obviously we have to relieve them of the consequences. On the technical level, we have a committee in NUCLEN and another in NUCLEP with a German majority and a Brazilian observer. That committee exists so that the Germans may assume the technical coresponsibility for the product that comes from the companies. We may disregard a decision of the technical committee, as provided in the statutes, but that would suspend KWU's responsibility. That machinery made possible German coresponsibility, which provided the opportunity, for example, for NUCLEP to supply the pressure vessel for Atucha-II in Argentina.

[Question] Is Argentina more advanced than Brazil?

[Answer] I do not like the question because it can give the impression of emulation. If we consider the existence of a commercial plant in operation, they are more advanced. But we have a reactor factory, which they do not have. I believe there is parity, moving toward superiority on our part in relation to Argentina.

[Question] If everything is fine--there is no German veto, the Argentines are not more advanced and we really need the plants, NUCLEBRAS is sure of what it is doing--why all that secrecy?

[Answer] It is the government that is sure. NUCLEBRAS is only an instrument of implementation. There is not a problem in Brazil that is discussed more than nuclear policy. I doubt that there is any other president of a state enterprise that has spent more time than I testifying before congress, special committees and the congressional investigating committee.

However, discretion is necessary with regard to the selection of sites for plants in order not to unleash real estate speculation. The site of the Sao Paulo plants was proposed by the Sao Paulo Electric Power Company (CESP). We are going to study it in detail.

[Question] How about the atomic waste?

[Answer] There is a lot of nonsense circulating about atomic waste. Do you not find it strange that there is concern only about the so-called atomic waste coming from civil activities for peaceful purposes? Nobody talks about the waste generated by the production of nuclear weapons. You do not see any protest anywhere in the world against the military use of nuclear energy, which generates huge amounts of atomic waste. From all the noise that is made hereabouts, nobody would imagine that there are 70,000 megawatts of installed nuclear energy in the United States. It is building 90 more plants. In the case of Three-Mile Island, the press only increased the misinformation. What was feared was a chemical explosion, not a nuclear explosion, because of the famous hydrogen bubble that formed inside the reactor. But even that chemical explosion was not possible because there was no oxygen. And in order to have a nuclear explosion, it is necessary to have a critical mass. There is none in the enriched uranium reactor in the volume and concentration necessary for an explosion. In a nuclear plant for civil purposes, the amount of high-activity waste, properly speaking, is insignificant: 1 cubic meter per year, in the case of Angra-2. The whole Brazilian nuclear program will produce 8 cubic meters per year, which would fit into a room. That waste is treated, calcined, vitrified and placed in stable geological formations which do not represent any problem for anyone.

[Question] That means that in your opinion, nuclear energy is not dangerous?

[Answer] No. It presents some danger but not greater than other activities. I would even say that it is less, such are the precautions in planning, building and operation of the plants. It has been proved statistically that nuclear plants are safer than hydroelectric plants. And much more than oil, especially that continental shelf oil.

[Question] That is not the opinion of many scientists. Did anybody from NUCLEBRAS follow the discussions of the Brazilian Society for the Advancement of Sciences (SBPC)?

[Answer] No, because we were not invited. From the information publicized, we did not feel that there was really any expectation of an important scientific contribution. They were concerned about the problem of Malu Mulher, TV, etc. We were ready to show up. We want to debate. Proof of that is through the initiative of the Brazilian Government and the coordination of the National Nuclear Energy Commission (CNEN), we had a big seminar a month ago with the participation of German scientists to discuss safety problems. No opposing scientist showed up. They were invited and did not attend. Another example: the senate investigating committee asked us to arrange for Professor Becker, the inventor of the jet nozzle (centrifugal jet) enrichment process to come. He came and gave a talk before the senate. On the initiative of Senators Dirceu Cardoso and Itamar Franco, the congressional investigating committee sent an invitation to all the scientists, with paid transportation and hotel accommodations. Only Mario Schemberg showed up, saying he would not ask technical questions because he did not understand the enrichment process. He wanted to ask political questions.

[Question] To what do you attribute the opposition of the scientific community?

[Answer] There is always tension between the scientist, who wants to improve the plan continually, and the engineer, who needs to freeze the plan to define its industrial utilization. The age of the scientist is gone. It is now the age of the engineer. That occurred in the United States with the Manhattan project. In Brazil, the circumstances are different but the psychological phenomenon is the same. We do not have the time nor the resources for an original plan to be created in Brazil.

[Question] We talk a lot about the agreement with Germany. But Brazil already has two more nuclear agreements, with Argentina and Iraq. In the case of Argentina, the keynote of peaceful use appears to be viable. But in the case of Iraq, a country that is not lacking in energy, the suspicion of military use seems clear.

[Answer] The agreement with Argentina is broad and provides for collaboration at the political-diplomatic level as well as specific collaboration on the scientific and industrial levels. We will supply heavy equipment for the Argentine nuclear plants. Brazil will lease uranium concentrate from

Argentina and will buy the services of Argentine industry for the manufacture of zircaloy pipes. It is an agreement that went beyond rhetoric despite the technological differences between the two programs.

As for Iraq, I do not agree with the inference of the question. It is not a matter of military use of nuclear energy. In the Middle East, the countries that more seriously and objectively utilize the funds derived from the sale of oil seek the best application of those funds. They know that the oil resources are not inexhaustible. It may be better business to consume nuclear-electric energy and export oil. They are taking the first steps in their program. Brazilian aid is in a very elementary stage in terms of exchange of experience in the area of licencing, and personnel training. We are not transferring any sensitive technology. We are free to export all of the know-how acquired in Germany except that pertaining to enrichment and reprocessing. The agreement with Iraq respects all international obligations. Iraq is a signatory of the nonproliferation treaty. We are not. Besides, that agreement has not yet gone into effect because it depends on the approval of the Brazilian congress.

[Question] What is the reason for the NUCLEBRAS' bad press image?

[Answer] I do not believe NUCLEBRAS has a bad press image. What may have a bad press image is the Brazilian nuclear program. Among the possible reasons is secrecy, which was essential in the international negotiation phase. Once the negotiations were concluded and approved by the congress, the program was made public. An attempt is being made to create the impression that secrecy continues but that is not true.

Paulo Nogueira Baptista:
"NUCLEBRAS has no secret"

"A nuclear plant is very safe; safer than oil platforms"

"There is no alternative to the use of nuclear energy"

"NUCLEBRAS does not need scientists but engineers"

"We are ahead of Argentina in building reactors"

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FOREIGN INFLUENCE CHARGES DENIED BY NUCLEBRAS

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 16 Aug 80 p 22

[Text] In Rio yesterday, NUCLEBRAS [Brazilian Nuclear Corporations] published an official note to explain a memorandum sent to Senator Dirceu Cardoso in which 16 NUCLEP [NUCLEBRAS Heavy Equipment, Inc.] engineers charge there "is effective control of that factory by German and Austrian technicians of the KWU, GHH and Voest Alpine, who adopt a practice which favors the constant increase in the influence and number of foreigners in the technical area."

NUCLEBRAS says in reply that concern over an alleged foreign supremacy in technical and decision-making positions is not warranted, stating "The transfer of technology in the manufacturing of heavy equipment for nuclear reactors is within a context which stipulates the gradual replacement of foreigners in technical positions and functions by Brazilians as they acquire the necessary skills. Thus, the training of Brazilians by foreigners within the NUCLEP factory is the natural result of agreements signed and a need inherent in the process of transferring technology."

NUCLEBRAS explains that the letter from the group of engineers is the result of a misunderstanding. After receiving it, the director-superintendent, Alfredo do Amaral Osorio, showed the signers that their allegations were unwarranted in merit and in form. According to NUCLEBRAS, the engineers acknowledged the error in which they had incurred and asked that the text of the letter be ignored.

As to the actions in the transfer of technology in the area of human resources of the technical area of NUCLEP, NUCLEBRAS states that the gradual replacement of German and Austrian technicians by Brazilians is in keeping with a schedule, which pursuant to the contract, will be concluded at the termination of the construction of heavy components for the fourth powerplant in the agreement or in 1986. NUCLEBRAS says that as of now, of the 36 positions of authority in industrial management

29 are occupied by Brazilians and only seven by Austrians or Germans. Of the 81 enginners of that area, 62 are Brazilians and only 19 are foreigners. The entire active labor force in industrial management: 546 welders, mechanics, boilermakers, machine operators and so forth, is made up of Brazilians. The number of active foreign engineers at NUCLEP is that necessary for the present phase of the factory, according to the corporation note.

CPI in Agreement

Senator Itamar France of the PMDB [Brazilian Democratic Movement Party] revealed in Belo Horizonte yesterday that government envoys are seeking out the opposition so that its representatives will return to membership in the Congressional Investigating Committee [CPI] which is investigating the Brazil-Germany Nuclear Accord.

Itamar, who headed the CPI, said he has already been sought out by Senator Passos Porto of the Espirito Santo PDS [Social Democratic Party] in that respect and he has learned that the PMDB leader in the Senate, Paulo Brossard, received the same appeal the night before last at the home of Senator Jarbas Passarinho, government leader in the Senate.

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CSO: 5100

DISAGREEMENTS IN NUCLEAR NEGOTIATIONS WITH ARGENTINA DENIED

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 21 Aug 80 p 8

[Text] According to NUCLEBRAS [Brazilian Nuclear Corporations] President Paulo Nogueira Batista, agreements in the nuclear area signed between Brazil and Argentina mainly cover two subjects: the first has to do with the leasing of uranium concentrate, which the CNEA [National Atomic Energy Commission] will supply NUCLEBRAS for a period of 2 years, the equivalent of 240 tons of the product through a series of partial deliveries between 1981 and 1982. This is to complement Brazilian production in Pocos de Caldas and during 1983 and 1984 NUCLEBRAS will return the 240 tons, also in partial shipments, and with "interest" paid in uranium at six percent per year.

The second agreement refers to the supply by CNEA of zircalloy pipes pursuant to a program of progressive qualifications "based on the international procedures adopted." NUCLEBRAS will acquire 160,000 meters of pipe initially to be delivered as of 1983. In that respect, CNEA informed KWU [Kraftwerk Union] of its desire that KWU use NUCLEP [NUCLEBRAS Heavy Equipment, Inc.] (a subsidiary of NUCLEBRAS) as a contractor for providing services for manufacturing the reactor vessel of the Atucha II Powerplant. The KWU, according to Paulo Nogueira Batista, has already sent NUCLEP a letter of intention so that it may provide such services within the framework of the contract between the German firm and the CNEA for the construction of the Atucha II Powerplant.

Without Disagreements

Brazilian and Argentine sources yesterday denied that there have been any disagreement in negotiations in the nuclear area. Itamaraty denied that it had shown any disagreement the evening before with the president of CNEA, Admiral Castro Madero, with respect to an understanding on the sale of Zircalloy to Brazil. The Foreign Ministry of Foreign Affairs also said that it was not referring to the impossibility of signing a document in that respect. "We do not deny that a document of intention may be signed, we only say that an accord will not be signed," commented an important Brazilian official source.

Of the documents stipulated, only one was not signed and that was the one which stipulated the manufacturing of fuel elements for research reactors. The rest, however, were ratified: 1--Agreement for the exchange of notes approving, and placing into effect, the protocols of execution in the nuclear field; 2--protocol of execution between the CNEN [National Nuclear Energy Commission] and the CNEA with respect to cooperation in the field of training human resources in the nuclear sector; 3--protocol of execution between CNEN and CNEA with respect to the exchange of technical information in the field of nuclear energy.

Yesterday, Castro Madero repeated that the understandings between Brazil and Argentina would develop in the following fields: fuel for a research reactor (which was not signed yesterday), equipment for Atucha II and the supplying of know-how on lixiviation of uranium by Argentina.

The documents signed yesterday in the nuclear field have the basic objective of training human resources and the exchange of technical information. In the first case, resources from state and private entities and courses and programs for training human resources already underway will be used jointly. The infrastructure already existing will be used whenever possible. The protocol, which made the idea official, will be in effect for 10 years and it may be extended automatically for successive periods of 2 years.

The exchange of technical information will include the granting of bibliographical data and the development of a data processing system. The document signed says expressly that the data processing system will be of "free use" by the other parties, but it may not be passed on to third parties by the receiving party except in cases permitted by the grantor.

Also important was the signing of the agreement, through the exchange of notes, creating a mixed task force consisting of PETROBRAS [Brazilian Petroleum Corporation] and Government Gas Deposits. The system of a mixed commission was also employed for the study of measures aimed at facilitating tourism between the two countries. Tourism has increased greatly in the past 2 years, primarily favoring Brazil since the change in the economic-financial situation of Argentina somewhat restricted the visit there by Brazilians.

8908
CSO: 5100

ANGRA I OPERATION DATE DELAYED UNTIL MAY 1981

Rio de Janeiro O GLOBO in Portuguese 22 Aug 80 p 19

[Text] Licinio Seabra, president of FURNAS [Brazilian Powerplants] reported yesterday that the Angra I nuclear powerplant has experienced a new delay in its date of operation, which up to now had been expected to be next December. Seabra said that a number of minor problems delayed the beginning of commercial operations until May or June of next year.

The president of FURNAS declared that the establishment of the rate of work on nuclear projects and on the transmission line of Itaipu in 1981 will be done only after it is known how much money is available. He estimates that the budget requirements of the company at 1981 prices will be 100 billion cruzeiros next year.

At this time, he said, FURNAS owes contractors and suppliers nearly 3.5 billion cruzeiros, some of them 60 days overdue. "The situation is not good at all in terms of cash availability."

Nuclear

Licinio Seabra said that the cost per installed kilowatt of Angra I is estimated at $2,000, much less that the cost forecast for units II and III. In terms of cost of that power, when the powerplant begins to operate commercially next year, FURNAS will have to raise the price of its power by nearly 40 percent. He said that amount should not be completely passed on to the consumer but the decision on readjustments will be done by the National Water and Electric Power Department.

With respect to Angra II, Licinio said that the work of reinforcing the piling is progressing normally and should be finished by April of next year when the concrete will be poured for the slabs on which the building where the reactor will be located will rest.

With respect to the decision as to where the place for the construction of Angra III will be, the president of FURNAS averred that the solution will be found by the end of September. He reminded, however, that the rate of construction of that powerplant will be determined only in terms of the resources the corporation has available next year.

The first equipment built in West Germany by KWU for Angra II will arrive next year. In terms of delays in the project, the equipment will have to be placed in storage for 3 years.

Yesterday, the new financial director of NUCLEBRAS [Brazilian Nuclear Corporations], Carlos Tadeu Freitas Gomes, was sworn in to replace Vicente Costa e Silva, who resigned some months ago because he disagreed with the administrative policy of NUCLEBRAS. The press was not admitted to the ceremony.

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CSO: 5100

BRAZIL

KWU USE OF 'CONFIDENTIAL' CLASSIFICATION SCORED

Abuse Charged

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 24 Aug 80 p 5

[Text] Kraftwerk Union (KWU), in compliance with the Technical Information Contract--TIC--signed at the beginning of 1976, is sending NUCLEBRAS [Brazilian Nuclear Corporations] a number of documents with the stamp "Confidential Information," documents which are in fact outdated or accessible to the people and do not represent any relevant complementary information within the program of German nuclear technology transfer to Brazil.

It is a matter of blank paper and index card samples, catalogs of equipment made by German manufacturers, technical specifications, including some North Americans which can be purchased for $2.00; reports of visits by clients and even dossiers of visitors, in addition to legislation on nuclear legislation which is at the disposal of the public in libraries and bookstores. Those papers carry the stamp "Confidential Information Furnished by KWU to NUCLEBRAS Under the Fuel TIC." In this case the documents have to do with nuclear fuel and were sent to NUCLEBRAS, however, each subsidiary of the corporation has its own TIC.

According to reliable sources of the sector, the TIC, a document signed separately between NUCLEBRAS and KWU at German insistence, was completely unnecessary because the papers by themselves do not represent anything and the commitment assumed actually meant the sale of one more German package. The KWU defended the need of that contract whereby NUCLEBRAS will receive the material published by the international technical press and copies of nuclear plant installations, claiming that it is an important item in the process of nuclear technology transfer. Under the same justification, the contracts for providing equipment and engineering services have been signed at high prices, moreover, the companies participating in the nuclear program are being forced to enter into contracts for technical assistance with German firms.

Thus, the equipment imported for the Angra II and III nuclear powerplants, which in December 1979 was priced at nearly $1.3 billion (the total cost of the equipment, including that which will be made in Brazil, was estimated at $1.82 billion and was purchased at prices much higher than those on the international market at the time they were bought around the middle of 1976). There is an official estimate that there will be costs of around $800 million for engineering and installation services of the equipment in the two powerplants at today's prices, the greater part of which will go to NUCLEN [NUCLEBRAS Engineering, Inc.]/KWU by the end of the construction of the two units.

Even so, there exists the possibility of additional expenditures because of project errors, such as that which took place with the foundations of Angra II, which cost $326 million. The new project for reinforcing the piling will cost FURNAS [Brazilian Powerplants] an additional $1 million.

It would be well to ask, say these same sources, how many times Brazil is paying for the technology of a "standard plan" of a KWU powerplant, which because of this fact should cost less. The money paid to NUCLEN is in large part passed on to KWU by means of Contract No. 5, whereby the German corporation provides technical assistance to the NUCLEBRAS subsidiary.

With respect to the TIC, available information is that it would also include some personnel training and its cost is appraised by the same sources at millions of dollars. The TIC would also include the payment for German technicians, whose price is extremely high. The cost per man day is normally calculated in terms of the technical salary multiplied by some index, normally 1.75, to cover the general expenses which the contracted corporation has to assume as a result of providing those services. However, the index adopted by the Germans is 3.33.

The Brazilian Government justifies the costs as a result of the transfer of technology, a theory which was defended by NUCLEBRAS President Paulo Nogueira Batista when he explained the overpricing of the Angra II and Angra II powerplant equipment: "It costs more because the technology is included in the equipment."

Abuse of Secrecy

The use of the "Confidential" stamp placed by KWU on papers having to do with the action of fuel for light water reactors, discussed in a meeting in Illinois (USA) in May 1977 or in the "Brief Guide For The Handling of UF," published by the U.S. Atomic Energy Commission, reflects the spirit with which the Brazil-Germany Nuclear Accord and the Brazilian nuclear program have been managed. Withheld from public knowledge, the most run of the mill information on the progress of projects in the area are treated as matters of "national security" and figures on the expenditures by NUCLEBRAS, for technology transfers for example, or on the financial condition of the corporation can only be obtained through a hearing requested by the members of the Nuclear Congressional Investigating Committee from the comptroller's office.

The phase in which research in Germany is in the development of the jet-centrifuge project or how the implantation of NUCLEI (NUCLEBRAS Isotope Enrichment) or the progress of the enrichment plant are not known with any assurance either.

Senator Confirms Charges

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 26 Aug 80 p 32

[Excerpt] Senator Dirceu Cardoso (Espirito Santo-no party affiliation) yesterday confirmed in Rio the charges made by O ESTADO Sunday with respect to the sending of worthless documents to NUCLEBRAS by KWU with the classification of "Confidential." The legislator said that he has "other documents of that type," confirming the "action by KWU of sending papers without any importance or confidentiality." He said that he will present those papers at the next Senate Nuclear Congressional Investigating Committee meeting, although he has already withdrawn from the commission. He declared he is convinced that the transfer of German nuclear technology "will only take place over a very long time, the end of the century, and only after Brazil acquires the eight reactors stipulated in the agreement."

NUCLEBRAS Explains Classification

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 27 Aug 80 p 24

[Text] In an official note revealed yesterday in Rio, NUCLEBRAS admitted that some documents of public knowledge were "inadvertently" stamped "Confidential" in a transfer made by KWU to the corporation, as was charged by O ESTADO in its Sunday edition.

The note states that "the technical information contract between NUCLEBRAS and the KWU in the area of fuel, transfers to NUCLEBRAS all the technical documentation required for the nuclear fuel manufacturing project such as the project methods for fuel, codes for fuel calculation, codes for the behavior of fuel in operation in the reactor, process techniques in manufacturing as applied to nuclear fuel, and so forth. This documentation is transferred to NUCLEBRAS at a price which is fixed and regardless of the volume of documentation transferred or to be transferred."

The note states that "This being so, and since additional documents do not mean an extra cost of NUCLEBRAS, KWU has been requested that it send copies of important references such as DIN standards, reports and technical magazine articles mentioned in that confidential technical information, along with the transferred confidential technical information. Otherwise it will be necessary for NUCLEBRAS to make an additional effort in bibliographic research and spend more time and money."

The corporation also explains that project documentation is generally treated in a confidential manner, there being several different types of confidentiality, depending on the subject matter. "However, within the framework of the contract, a part of the documentation transferred is not confidential, although it is necessary for the process of the project of nuclear powerplants and includes such things as technical specifications and other documents of public knowledge. NUCLEN states that up to this time there has been practically no error in the classification of documents by KWU in the more than 25,000 documents transferred."

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BRAZIL

FORMER NUCLEN DIRECTOR SCORES KWU ON TECHNOLOGY TRANSFER

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 26 Aug 80 p 32

[Text] Joaquim de Carvalho, former director-superintendent of NUCLEN [NUCLEBRAS Engineering, Inc.], declared yesterday in Rio that "to expect the KWU to transfer technology to subsidiaries of NUCLEBRAS [Brazilian Nuclear Corporations] in which it participates in the status of a partner with technical command, is the same thing as leaving the wolf to watch the sheep, since we all know that the Germans, in addition to being excellent technicians, are also the greatest businessmen in the world."

In his opinion, "a reasonable solution" to make possible some assimilation of technology "transferred" by means of the Nuclear Accord would be to involve the Brazilian research institutes and groups already experienced in providing technical assistance services to the industry in the process. As examples, Joaquim de Carvalho named the Technological Development Company linked to UNICAMP [University of Campinas], the Institute of Energy and Nuclear Research (IPEN) of Sao Paulo, the Department of Materials Science of the University of Sao Carlos and the Air Force Technological Center in Sao Jose dos Campos, "among other institutions which are known to be competent and which were left out of the Nuclear Accord."

The former NUCLEN director believes that it is only possible to transfer technology to a country which has a sufficiently developed industrial structure to assimilate it. "That depends on the structure of the industrial sector, the way in which the industrial establishments are organized and on the number of researchers and technicians working directly with them or in research institutions contracted by those establishments."

That situation, according to him, does not exist in Brazil where "industrial companies having research, development and engineering departments employing a sufficient number of researchers and engineers in development are very rare."

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CSO: 5100

BRAZIL

ONLY ENOUGH MONEY FOR FOUR NUCLEAR PLANTS SAYS NETTO

Netto Talks to Press

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 27 Aug 80 p 24

[Text] Minister of Planning Delfim Netto yesterday repeated that Brazil "could build 20 or 30 nuclear powerplants in the future. That is not important." However, at this time, there are only enough resources for the first four stipulated in the accord signed between Brazil and Germany. At the same time, he was cautious on the future of the other four, which, as has already been announced by NUCLEBRAS [Brazilian Nuclear Corporations] President Paulo Nogueira Batista, are necessary for the entire cycle of the transfer of technology to be passed on to our country.

As far as the minister is concerned, the important thing "is the national utilization with respect to the first four powerplants," preferring, however, not to reveal estimates of expenditures in carrying out the plan. In his opinion, the powerplants shall be built as time is available and he is not concerned, as he told reporters twice, with problems of deadlines. Delfim Netto also did not wish to comment on the problem of inflation with respect to the Brazilian nuclear program, saying he is not concerned about the subject "because we have resources for four, as I have already said."

Poorly Interpreted

"The Brazilian Government is going to fulfill the agreement of nuclear cooperation signed with the FRG completely," declared Alexandre Garcia, Planalto Palace spokesman, yesterday with respect to recent statements attributed to Minister Delfim Netto.

According to the spokesman, the minister of planning was "poorly interpreted" by the press: "He did not mean to say that Brazil will restrict itself to buying only four of the eight nuclear powerplants stipulated in the accord."

"Delfim Netto," added the official, "is one of the greatest boosters of the nuclear accord and openly in favor of its total fulfillment." The purchase of the eight powerplants is necessary, still according to Alexandre Garcia, so that national industry may, as of that time, economically build all the components necessary and later on build complete powerplants.

NUCLEN Voices Opposition

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 28 Aug 80 p 31

[Text] "If we stop at the fourth nuclear powerplant, the technology we acquire from Germany will be lost," declared the superintendent of NUCLEN [NUCLEBRAS Engineering, Inc.], Ronaldo Arthur da Cruz Fabrizio, in the plenary session of the Chamber of Deputies National Security Commission.

He also declared that "as of the installation of the eighth powerplant, 70 percent of the costs will be paid for in national money because the agreement by Brazil and Germany, as of the fourth powerplant, does away with the mandatory provision of technology to NUCLEBRAS."

However, the costs for producing one kilowatt of power generated by nuclear fission should be higher than the $1,100 paid in developed countries and also much higher than the production of a kilowatt of hydroelectric power, according to reports by NUCLEBRAS Director John Milne Albuquerque provided to the same commission.

He justified the differences in costs in the production of a nuclear kilowatt "because we are paying for our apprenticeship; for these reasons the numbers are a little nebulous." The technician said that the present price per kilowatt of hydroelectric power is very variable and reaches as high as $350 per kilowatt.

The NUCLEN superintendent stated in his deposition that the transfer of technology from Germany to Brazil is taking place and at that time he defended the method of direct assimilation by private enterprise. He also acknowledged the importance of participation by private enterprise in implementing the Brazilian nuclear program.

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CSO: 5100

BRIEFS

NUCLEAR TECHNOLOGY EXPORTS--Ronaldo Fabricio, superintendent of NUCLEN [NUCLEBRAS [Brazilian Nuclear Corporations] Engineering, Inc.] yesterday forecast in Porto Alegre that within a few years Brazil will be one of the main exporters of nuclear technology, equipment and fuel. He reported that a "number" of negotiations are being carried out at this time "with several markets" which, however, he did not want to identify "so as not to jeopardize the transactions." According to Fabricio, Brazilian production of uranium and heavy equipment will become "important sources of revenue" in the future. The president of the Brazilian Physics Association, Mario Schemberg, appealed to the Brazilian Government to apply "those tens of billions of dollars to coal, biomasses and other more viable programs." He reminded that the agreement with Germany is transferring an old technology "of 30 years ago" to Brazil. Schemberg also asked that scientists warn the people and government that the nuclear program is an error. [Text] [Sao Paulo O ESTADO DE SAO PAULO in Portuguese 19 Aug 80 p 27] 8908

CSO: 3010

ISRAEL

BRIEFS

ON NUCLEAR REACTORS--Prof Yoka Arad, speaking yesterday at a session of the energy committee of the Knesset headed by MK M. Harish, said that there is no justification for building nuclear reactors to produce energy. He said that the building of reactors involves complex technical problems and well-kept professional secrets. Israel is too small to produce all the components of a nuclear reactor by itself. It cannot do it without massive aid in the supply of nuclear fuel, and the manufacturing of all the components. Another problem is that the private manufacturers cannot sell nuclear reactors without the consent of their governments, therefore, we need agreements with the respective governments. Due to President Carter's freeze on the sale of nuclear reactors to foreign countries, our energy ministry tries today to concentrate on long-term planning, creating the underlying structure and training people. The option of producing electricity in a nuclear reactor would not be feasible until the end of the century. 12-13 years would pass from the day a decision is made on locating the site until the building stage. Even so, it is thought that in the year 2000 there would be (in Israel) 2-3 nuclear reactors, each of which would produce about 900 megawatts. The chairman of the atomic energy committee recommended to use the interim period in the political situation for preparations and for locating all the possible sites. The decision is to build the reactor inside the country by a water canal. It was also reported in the committee that Germany and France also failed when they tried to build the reactor themselves, and finally obtained American technology and an American license. The director of the electric company, I. Tolipin, also thought that we cannot ensure the supply of electric fuel ourselves, while Prof Farnu said that the building of nuclear reactors is not a good economic investment, and there are better potential investments in the economy. Investment in the building of a reactor would render profits only after 20 years, and there are financing problems and security problems. The energy committee will have another session and present its recommendations to the government at that time. [Text] [Tel Aviv AL HAMISHMAR in Hebrew 30 Jul 80 p 1] 9433

CSO: 5100

DENMARK

GREENLAND GROUP PROTESTS FIRST URANIUM SHIPMENT TO DENMARK

Godthaab GRONLANDSPOSTEN in Danish 21 Aug 80 p 13

> [Text] The first shipment of uranium ore from Kvanefjeld will meet with large demonstrations when it arrives in Denmark--presumably Holbak harbor.

The first shipment of 2,100 tons of uranium ore from Kvanefjeld will get a warm reception when it arrives somewhere on Zealand early in September. KUAK, the Greenland Committee Against Uranium Extraction, plans to stage a large demonstration on the pier, demanding an immediate stop to all research activity in connection with Greenland uranium at Riso, which is the ultimate destination of the uranium ore shipment. A large number of Danish protest groups are also expected to join in the demonstration.

The royal Danish "Edith Nielsen" will cross the Atlantic with the first shipment of uranium ore, altogether about 2,100 tons from Narssak. An equally large shipment is to follow so that the total amount of uranium ore destined for extraction research at Riso will be about 4,200 tons.

The Demonstration

One of the leaders of the Greenland Committee Against Uranium Extraction, KUAK, Kaj Kleist a teacher from Copenhagen, told GRONLANDSPOSTEN that police has been informed of the demonstration and that a large turnout is expected. The protest was initiated by KUAK and Kaj Kleist will open the demonstration with a speech on behalf of the committee. Their demands include an immediate stop to all research activity in connection with Greenland uranium and the right to ownership of Greenland's substratum.

"We have received requests from various parties and other groups in Denmark to join the demonstration," said Kaj Kleist. "The protest is also backed by OOA, the Organization for Information About Nuclear Energy in Denmark. It has been somewhat of a problem to plan the demonstration and to inform the police because we are not yet certain where the "Edith Nielsen" will dock," Kaj Kleist concluded.

Most Likely Holbak

Jorgen Jensen, director of uranium research at Riso, explained that transportation bids have been requested from various harbor and railroad facilities. "The limekiln harbor in Copenhagen as well as Koge and Holbak harbors have been considered. But it will most likely be Holbak and, according to my estimates, the first shipment should arrive about 7 September. Those in charge of arranging the demonstration are certainly welcome to check with Riso as to the exact time and place of arrival as soon as we have the information," Jorgen Jensen added.

He said the uranium ore can be transported from the harbor to Riso in a couple of days by railroad. The ore will be loaded directly from the ship onto railroad cars so there will be no intermediate storage.

When the ore arrives at Riso it will be placed on a bed of gravel near the location where a crushing mill is being constructed to process the ore. Jorgen Jensen expects the uranium processing facility to be completed and in operation some time in 1981. Initial parts for the processing facility have already arrived at Riso.

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CSO: 5100

BREEDER REACTORS, NUCLEAR WEAPONS PROLIFERATION

Paris DEFENSE NATIONALE in French Aug-Sep 80 pp 129-142

[Article by Bertrand Barre]

[Text] On 7 April 1977 President Carter caused a quite unexpected stir in the nuclear world by announcing that the United States was putting off indefinitely the development of fast neutron breeder reactors* as well as the commercial reprocessing of fuels for conventional reactors since these technologies--according to him--presented special risks of proliferation. He also asked the international community to launch a 2-year overall study, the INFCE [International Nuclear Fuel Cycle Evaluation] for evaluation of risks of proliferation presented by the various nuclear fuel cycles. (The term "fuel cycle" covers the whole of the operations which the fissionable material undergoes before being placed into a reactor for production of energy and after its withdrawal from the reactor; these operations are shown schematically in Figure 2).

The INFCE actually did get underway with experts from more than 40 countries participating. It is apparent that the Americans did not find great support there for their position and that breeder reactors, to which one of the eight task forces of the INFCE was devoted, and which were supported by Europeans, Russians, and Japanese, emerged largely unscatched.

Without presenting here the precise conclusions of the INFCE, the voluminous results of an international "consensus," which, by virtue of that, involve a bit of setting on the fence, and without authority to present France's official position in this matter, the author is here offering his personal opinion, which he has already had the opportunity of presenting at a colloquium of the SIPRI [Stockholm International Peace Institute] in September 1978 before a politely skeptical August assemblage generally convinced by President Carter's thesis.

Proliferation and Energy Shortage

I shall begin by emphasizing several paradoxes with which color the anxieties, also all too real, about the subject of proliferation of atomic weapons throughout the world. For example, most people seem more disturbed about the possible acquisition of a given country of a handful of kiloton bombs than by the accumulation of thousands of megaton bombs in the arsenals of the great nuclear powers.

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*See article by J. Y. Barre, DEFENSE NATIONALE, March 1980.

Likewise there is the fear, which I share, that the widening number of countries possessing the nuclear weapons does not prevent the observation that the proliferation which occurred from 1945 to 1968 with the accession to status of nuclear power of the United States, the USSR, Great Britain, and France in succession, has not been a factor of geopolitical destabilization but has perhaps contributed up to now to preventing the outbreak of a worldwide conflict.

It is another paradox that, in the military nuclear countries, atomic armament programs have not, and by far, caused as much dispute as peaceful programs for power plant construction.

At the technical level it is no secret that the nuclear powers have no hesitation in devoting vast efforts, in terms of manpower, time, and expense, to produce plutonium relatively free from heavy isotopes and to develop highly sophisticated electronic equipment and explosive devices, but that has not prevented a large public from being persuaded that a half-dozen terrorists with a little skill would have no difficulty in rapidly fabricating an atomic device with the kind of "dirty" plutonium which is produced in reprocessing the fuels of water reactors. Let us remember that in such case it would not be a question of "proliferation" properly speaking, but of diversion. The term "proliferation" is applied to sovereign states when they decide, openly or not, to provide themselves with nuclear armament.

We take note of all these paradoxes without being prepared to resolve them here, but one thing is certain and should not be lost from sight: the ultimate disaster is not proliferation per se but war. The danger of proliferation is that it entails the risk of making war more horrible but if, in seeking to reduce the dangers of proliferation, states take measures whose end result would be to increase the risks of war, that would be a tragic version of stupidity.

Going back through history, it is difficult to attribute any war to a single isolated incident; in most cases competition of some nature or other, whether for food, international status, territory, riches, or other resources.* All completion begins with scarcities and that explains why one of the causes of present international rivalry is competition for energy. It was not necessary to wait for the recent events in Iran to foresee that the plethora of petroleum which held down the prices of crude between 1974 and 1978 was not going to last. Independently of political vicissitudes, since 1969 we have been burning just twice as much petroleum than has been discovered during that same period (Mexico included). In the fact of that danger there exist, certainly, numerous hopes, in time, for harnessing unconventional forms of energy, but the only two solutions immediately available are energy conservation and nuclear energy.

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*Even conflicts whose principle cause was of ideological or religious origin were undoubtedly not completely "pure."

The latter, moreover, is in large part competitive and both greatly conserving of foreign exchange.

It cannot be denied that there is a connection between civil and military applications of nuclear fission, a connection born of the similarities in the knowledge, the materials, and the industrial development necessary to both, but this connection is a small one. The Hiroshima bomb exploded more than 10 years before nuclear electricity was produced upon a commercial scale at Calder Hall and up to the present, at least, military programs have never been developed with nuclear electric programs as the starting point. Under such circumstances renouncing civil nuclear energy would not suffice to preclude proliferation but, by aggravating worldwide competition for energy could lead to destruction of the fragile international equilibrium and at the worst, provoke precisely the nuclear war which that measure was supposed to have prevented.

In supporting the development of nuclear energy throughout the world we must accept a certain level of risk of proliferation but that is a lesser evil.

The Case for Breeder Reactors

Let us summarize the situation. There already is some risk of proliferation, whether civil nuclear energy is developed or whether it is renounced. By promoting nuclear electric programs throughout the world we inevitably increase this risk somewhat. The benefits to be hoped for in such development greatly exceed the dangers entailed in that increase in the risk of proliferation. Even if not always so formally stated, this position has for all practical purposes been adopted by everybody, the most fervent anti-nuclear element excepted.

More precisely, the level of risk presently accepted is that which corresponds to general deployment of slow neutron reactors, called thermal reactors, fed with slightly enriched uranium fuels* and operating on "open cycle," that is, without reprocessing (at least for an indefinite period). Such fuels are supplied by a limited number of countries which possess enrichment technology.

In his article published in a previous issue J. Y. Barre clearly emphasized to what extent this operation wastes uranium. It was restricted to the case of France but the illustration of this fact on the worldwide scale is striking, as it appears in the chart [Figure 1] made public at the world energy conference in 1977, which shows the annual demand of the countries of the OECD. Without introduction over the more or less short term of fast neutron reactors, worldwide uranium resources will hardly last any longer than those of petroleum or natural gas. A fast neutron reactor uranium 70 times less rapidly than a thermal neutron reactor of the same capacity: which makes any official responsible for energy conservation dream.... Certainly their technology is more sophisticated and their deployment--which requires a very large initial petroleum inventory--makes sense only for countries in which a considerable number of conventional reactors have already been installed.

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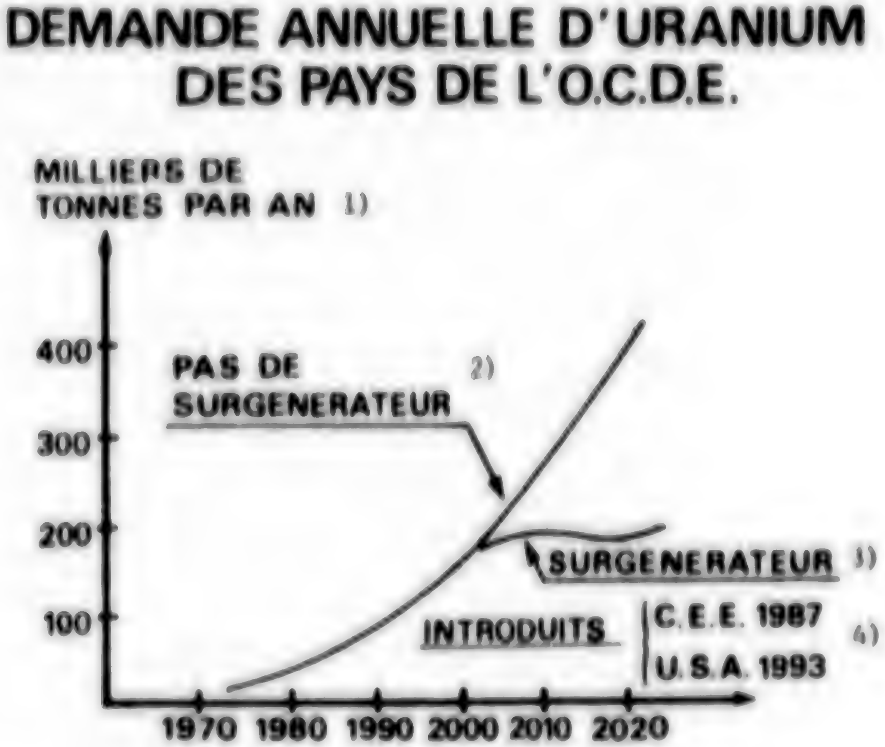
*The case of reactors fed with natural uranium is very much different; the fact that there is no enrichment "lock" and the possibility of unloading fuel without shutting down the reactor's operation make them much more "proliferating" but this is worthy of a separate article.

Figure 1. Annual Uranium Demand of the Countries of the OECD



Key:

1. Thousands of tons per year
2. Without breeder reactors
3. With breeder reactors
4. introduced EEC 1987
   U.S. 1993

At the stage of development where we now stand it is even difficult to predict with precision at what time the cost of producing their energy will be competitive with respect to conventional reactors. Moreover we are already certain--which is not so bad in the prototype stage--that a kilowatt-hour from the Superphenix will cost less than one from an oil-fired plant!

In the fact of these prospects, criticisms which are of three kinds are levied against breeder reactors in the area of non-proliferation:

after stealing "fresh" fast neutron reactor fuel elements, without much effort significant quantities of plutonium can be separated;

they manufacture, within their confines, plutonium of "military quality" without disturbance of their normal electricity generating function;

they make common place the reprocessing and fabrication of plutonium fuels, thus legitimately opening the way to "plutonium conservation" which is abhorred across the Atlantic.

Let us examine these various points to learn, in each case, whether they represent an actual increase of the risks in comparison with the acceptable level previously defined.

Uranium Cycle and Plutonium Cycle

The greatest risk is common to all cycles. It is the training of nuclear specialists in general. However, the "open" cycle has specific risks.

In a country which has an enrichment plant available, the risk depends to a considerable extent upon the technology utilized. Very high if ultracentrifugation is involved, it is small for gaseous diffusion and virtually nil for the French process of chemical processing. If the country buys its uranium enriched, which was our basic assumption that cannot remain eternally valid, especially to the extent that the reliability of American suppliers has become indeed questionable, the risk represented by the cycle upstream from the reactor is small. One need fear only that the slightly enriched uranium be a "short circuit" to military uranium if it is utilized in an uncontrolled enrichment plant instead of natural uranium. In fact, two-thirds of the total separation work has already been performed.

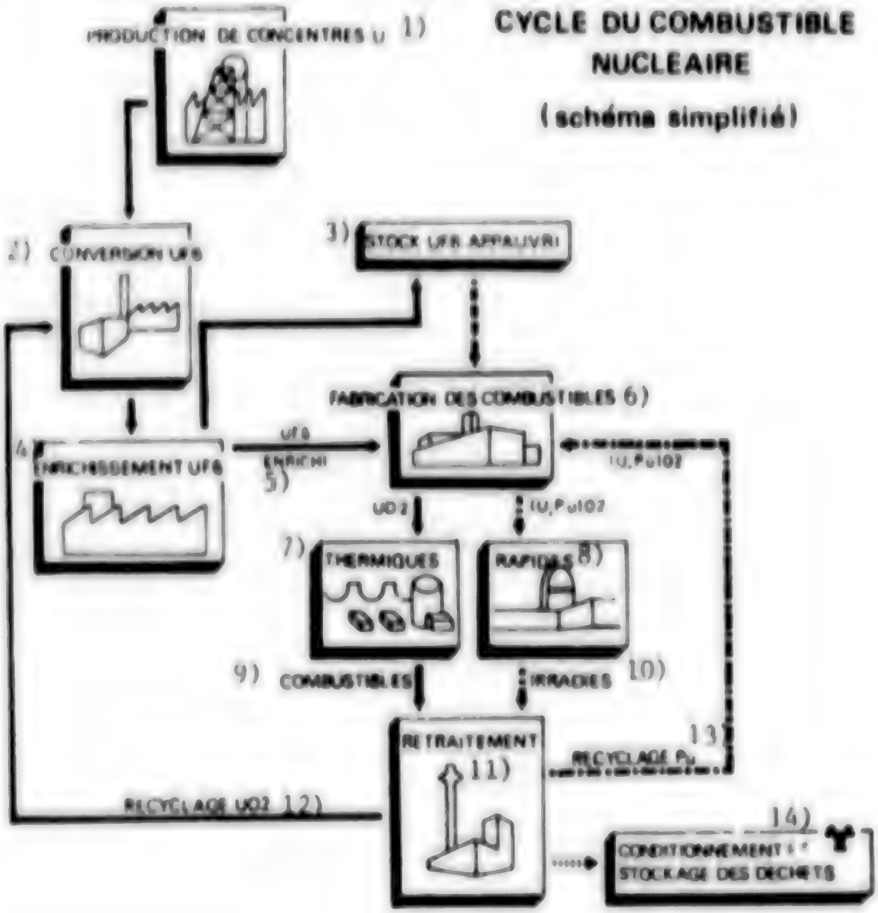
The greatest risk in fact lies downstream from the reactors in their cooling swimming pools. One 1,000 megawatt water reactor annually discharges on the order of 30 tons of a mixture of uranium, plutonium, and fission products. The plutonium constitutes about 1 percent of this mixture--let us say 250 kilograms.

From a purely chemical standpoint it would not be very difficult to extract the plutonium from such a mixture, and there would be no need to have recourse to exotic reagents difficult to procure. What makes commercial reprocessing difficult--where many countries have failed up to the present--is the necessity of processing, reliably and economically, for a long time, large quantities of still highly active irradiated fuels without exposing the workers to hazards and then of disposing of wastes without contaminating the environment.

On the other hand if it is desired only to recover a limited quantity of plutonium quickly without too much concern over costs or the quantity of plutonium remaining in the wastes it would be easy for a nation to construct a laboratory, rapidly (and discreetly), for extraction of plutonium "to be discarded after utilization," in order to reprocess elements already cooled down from a dozen years. At the end of that time the radioactivity will already be six times less than after 1 year of cooling, and even the concentration of plutonium 241 will have decreased by half. In this way the swimming pools for storage of irradiated elements progressively constitute plutonium mines from which it becomes easier and easier to extract the plutonium. By operating with "open" cycle such mines are being scattered upon reactor sites in the world....

In comparison, the closed cycle, as it is shown in the following schematic diagram [Figure 2], results in quickly collecting the irradiated fuel elements upon the reprocessing site at a time when their radioactivity very effectively protects them against any diversion.

Figure 2. Nuclear Fuel Cycle (simplified schematic diagram)



Key:

1. Production of uranium concentrates
2. UF_6 [uranium hexafluoride] conversion
3. Depleted UF_6 storage
4. UF6 enrichment
5. Enriched UF6
6. Fuels fabrication
7. Thermal
8. Fast [neutron]
9. Fuels
10. Irradiated
11. Reprocessing
12. UO2 [uranium dioxide] recycling
13. Pu [plutonium] recycling
14. Waste packaging and storage

The optimum economical size for a reprocessing plant corresponds to an annual capacity of between 500 and 2,000 tons of heavy metals. Each plant is therefore going to collect and reprocess the fuels from 20 to 80 reactors, which means that the number of swimming pools to be under close surveillance will be reduced in the same proportions.

Once the plutonium has been separated, and if there are fast neutron reactors to use it, it ceases to be a troublesome waste and becomes a fuel of great value. Under such circumstances it will become very economical to recycle it quickly into the reactors where the radioactivity again makes it inaccessible.

The sensitive points in this plutonium cycle are the completion of the reprocessing operations, the storage of the separated plutonium, the plant for refabrication of plutonium elements and, to a lesser degree, the transport of refabricated elements to the sites of the fast neutron reactors. Before examining whether these weak points can be strengthened, we may make a comparison of the two cycles. The open cycle results in accumulation of many tons of uranium at many sites distributed throughout the world, and the accessibility of this plutonium [which it contains] grows from year to year. The closed cycle enables fast neutron reactors to reutilize the plutonium produced by thermal reactors thus minimizing the worldwide inventory of plutonium.

In passing I emphasize one of the arguments made by J. Y. Barre: there is not a single difficulty in the way of using a battery of fast neutron reactors at will either as breeder reactors when the need for expansion of the battery require or as plutonium incinerators in the eventuality that one desires to be rid of it. Conventional reactors cannot destroy plutonium; what is more they can cause an increase in content of the 240, 241, and 242 isotopes.

It is this specific characteristic which must be balanced against the also specific disadvantage represented by the military quality of the plutonium produced within them.

In sum, it seems to us that the two cycles present very much comparable risks of proliferation. This, moreover, was the conclusion of the INFCE task force, and that only considerations of general technological level, economics, and energy policy should determine, for each country, the optimum schedule for construction of fast neutron reactors.

Strengthening the "Weak Points" of the Plutonium Cycle

The good report with which we have just ended the preceding paragraph does not relieve us from seeking to improve the situation even more. We are therefore going to examine successively the weak points we have enumerated.

The reprocessing plant--Since the heroic days of the Manhattan Project 32 techniques for reprocessing have been advanced to various stages of development but the only one which has attained the industrial stage is the process of liquid extraction with solvents known as the Purex process. Originally developed for the reprocessing, for military purposes, of highly irradiated metallic fuels, this process, suitably improved, is the one still exploited in the La Hague plant for commercial reprocessing of highly irradiated oxide fuels. It comprises five steps:

a) mechanical shearing of the fuel elements

b) dissolving the oxides (uranium, plutonium, and fission products) in nitric acid

c) extracting the fission products with solvents

d) separating the uranium and plutonium with solvents

e) separately purifying the uranium and plutonium.

Starting with step d) the plutonium is no longer "protected" by the very active fission products and it must therefore be under surveillance and protected by other means (which is certainly done at La Hague).

In the earliest plants, for each step there was a more or less corresponding separate mini-plant with the products going to the buildings successively, possibly going through buffer storage. Several samplings were provided to enable the process evolution to be followed by laboratory examination and the plutonium purification of step e) was accomplished in simple glove boxes in which this product, highly contaminating* but of low activity, was manipulated.

The modern plants constructed by COGEMA** now have a confinement enclosure virtually continuous from the beginning to the end of the process, and the samplings for examination are designed so as to preclude, physically, any uncontrolled withdrawal. Moreover, the plutonium extracted from water reactors is "dirty," too highly active to be manipulated in a simple glove box and the entire step 3) is automated and remotely controlled without direct access by the operators up to and including the dispatch to storage. This design of a plant like a tube with a single entrance and a single exit for the plutonium with no physical possibility of diversion has been characterized by the name PIPEX.

Plutonium Storage--The recycling of plutonium in thermal reactors necessitates preparation of mixed oxides, $(U, Pu)O_2$, with plutonium concentrations not exceeding 3 percent. Fast neutron reactors require oxides with higher plutonium content, but not more than 25 percent. Thus the use of plutonium for generation of electricity indeed does not require pure plutonium. A mixture with 30 percent of plutonium could be adjusted to any necessary content by simple dilution with pure uranium oxide during fabrication.

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* That is, dangerous upon direct contact, through manipulation, ingestion, or particularly inhalation, against which protection is easy.

**Compagine Generale des Matieres Nucleaires [General Nuclear Materials Company], a wholly owned subsidiary of the [French] Atomic Energy Commission (CEA).

Whether this 30-percent mixture be produced directly by a modification of step d) or from a mixture of oxides after step 3) it appears that authorization for only mixed oxides to leave the reprocessing plant would improve protection against possible diversion by slightly increasing the time required to fabricate a weapon.

Among the reprocessing plant's customers there will be some who have no immediate use for their recovered plutonium. To release this material would create a needless and avoidable risk of proliferation; it therefore seems logical to institute a mechanism--still to be defined--of international storage, preferably in immediate proximity to the reprocessing site to avoid unnecessary transport. From this storage the mixed oxide would be shipped only in accordance with the legitimate peaceful requirements of their proprietor.

Fabrication of Plutonium Fuel Elements--The mixed oxides provide protection somewhat better than pure plutonium, since a chemical separation is required before an explosive material is available, but it would be better still to transport only fully fabricated elements. First of all, it is a question of units easily numbered and hence controllable. In addition, cutting the sheaths and large stainless steel tubes which contains them would always entail loss of time to terrorists who might have been able to seize them, assuming that they successfully avoided contamination.

For these reasons it appears reasonable to locate the refabrication plant on the same site as the reprocessing plant which supplies it. In addition, this avoids construction of a separate unit for purification and recycling the fabrication waste which could otherwise itself constitute some risk.

Transport of Fuel Elements--To reduce transport to the maximum extent, if some sites are so adaptable, one may imagine "integrated sites" where there is a certain number of fast neutron reactors and their specific reprocessing and refabrication plants. There would at least remain the problem of transporting the first fuel charges for the reactors. This is a point which remains a weak one in our scheme but it can be considered that the limited number of such transports will justify very great "physical protection." Moreover, we must examine more closely against what risks we seek to guard.

If the fear is of a forceful carrying off by an attack of a terrorist commando group, the delay imposed by the chemical dilution and the steel packaging should enable police forces to intervene before the aforesaid commando group have pure fissionable material available. The Superphenix assemblies cannot be transported very discreetly nor can they be cut apart at the scene of the hold-up. One may also imagine that they be transported only in "tanks" similar to those which serve for transport of irradiated materials. It was also at one time contemplated to pulverize the plutonium along with some fission products but the disadvantages to the end use outweigh the advantage offered by this added protection.

Next, one may fear an organized diversion by the customer government itself for a true proliferation. It must then be asked whether it is probable that a government, having attained the technological development which enables it to have a fast neutron reactor operating in total security--which presupposes, remember, an already sizeable battery of conventional reactors, would choose to divert controlled elements, an open contempt of its international commitments while it has available, if it really wants to proliferate, easier and above all more discreet ways....

This being so it will be prudent to keep the stock of fresh elements at the base of the pile at a low level.

Conclusion

Without repeating the reasons which militate in favor of developing breeder reactors it may be useful to see in the following table the measures which can increase resistance to proliferation.

Coming out of thermal reactors the fuel element is protected during the first few years by its intense activity. To allow it to cool too long in situ would increase the risks of proliferation, so we suggest it be sent as soon as possible to the swimming pool of the reprocessing plant. During the next 10 years or more the world's undercapacity for reprocessing is going to result, between now and 1990, in a large accumulation of cooled fuels throughout the world and this fact cannot fail to be disturbing.

Reprocessing itself should be carried out only in a few large units whose design minimizes the risks of diversion from the line. All stores of plutonium separated from fission products should be kept at low levels and preferably in the form of mixed oxides. A mode of international storage should also be instituted to protect the plutonium while awaiting utilization.

It would certainly be preferable to locate the refabrication plants at the reprocessing sites. It must not be denied that this entails industrial problems because few countries are ready to concede a de facto monopoly in fabrication to the reprocesser, for love of non-proliferation. However, it should not be impossible to conclude adequate international industrial arrangements and thus avoid needless transport of non-fabricated fissionable material.

Finally, it is essential to return the fuel to the reactor for it is really there that the risks of diversion become nil.

Plutonium Cycle:
Prevention of Proliferation Risks

Plutonium cycle step	Associated risk	Preventive measure
Irradiated fuel		Self-protected (for several years)
Reactor swimming pool	Plutonium Extraction becomes easier and easier	Limit the time it remains in the swimming pool.
	Accountability becomes more and more difficult	Expedite the material to reprocessing
Reprocessing	Diversion during course of the process	PIPEX and mixed oxides.
Transport between reprocessing and storage	Diversion during transport	Physical protection Location of reprocessing and storage on same site
Storage	Diversion: in secret violent	International Control Physical protection
Transport between storage and prefabrication	Diversion during transport	Physical protection Location of fabrication and storage on same site
Prefabrication	Diversion in the plant or during transport	Returning plutonium only when needed Limited stocks Physical protection

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BRIEFS

ACCIDENT AT NUCLEAR POWER PLANT--Another accident has occurred involving one person being exposed to too great a dose of radiation in a nuclear power plant. The accident happened in Foramark-1 where a radiation protection engineer was exposed to 70 percent of the amount permitted in 1 year. Earlier this summer two similar accidents took place, both of them in Ringhals-1. [Text] [LD032048 Stockholm Domestic Service in Swedish 1600 GMT 3 Sep 80]

CSO: 5100

CANCELLATION OF HEAVY WATER EXPORT TO ARGENTINA DEMANDED

Geneva JOURNAL DE GENEVE in French 6 Aug 80 p 7

[Article by Jean-Pierre Gattoni: "While Contracts Have Been Signed, a Last-Minute Counterattack From Opponents: Antinuclear Groups Are Demanding Cancellation of Export Permit for Heavy Water Plant Destined For Argentina"]

> [Text] "Immediately withdraw the export permit granted to Sulzer Company for Argentinan heavy water plant." This is request submitted to Swiss federal government by "action group against nuclear exports" which regroups diverse groups and various persons from anti-nuclear groups, peace organizations and those in favor of aid to developing countries. In their opinion, it is absolutely certain that Argentina will utilize this "chemical plant" to produce the first atomic weapon in Latin America.

But to start at an earlier stage: 12 June last, the Federal Energy Office agreed to export a heavy water plant to Argentina. A contract, which totaled approximately 500 million Swiss francs, was obtained some months ago by a Zurich based Sulzer SA Company.

This heavy water plant must not leave Switzerland, say anti-nuclear groups, which includes socialist deputy Hansjoerg Braunschweig and physicist Andre Gsponer of Geneva, a member of Swiss Council for Peace. Why? In their opinion, it is evident that the South-American "military dictatorship" seeks to acquire--in obtaining this heavy water installation--the last element of technical system required to produce fission material, which will be used to produce atomic weapons. So claim these anti-nuclear groups. Do they have any proof? No, but the following simple indications:

--Argentina guarantees to use heavy water only for peaceful purposes is of no value, as this country has not signed the Nuclear Non-Proliferation Treaty nor Tlateloco Pact which prohibit nuclear weapons in South America.

--it is no accident that Sulzer should have been selected for this order: Switzerland does not impose controls on nuclear materials as strict as other countries. This helps explain the choice.

--it is also no accident that Argentina should have decided to develop heavy water reactor technology: this is the most direct and easy way for this country which has at its disposal large uranium ore reserves.

--The action group against nuclear export also finds it curious that Argentina should still develop its atomic energy program, which will cost more than 20 billion Swiss francs in 1995, while the country has a large number of energy sources either currently exploited or which could be exploited (large oil deposits, natural gas). According to this group, military reasons are obvious.

The action group therefore invites Swiss federal government to withdraw this export license at once--a very late request; the authorisation procedure has now been completed. It also invites the Swiss delegation to a conference which will open on 11 August 1980 to review the Nuclear Non-Proliferation Treaty in order to move toward a more efficient control of nuclear proliferation; more particularly in relation to "second pilar" of treaty; that is, negociations directed toward total and general disarmament.

Prudence

It should be said that, in conformity with Swiss Nuclear Act of 1959, and Swiss regulations of 17 May 1978 on permits required for nuclear activities, the Sulzer authorization to export, provided by federal authorities, is accompanied by a whole string of restrictions and conditions. In addition, the authorization can be canceled at any times, if conditions are not fulfilled as required. For instance, Argentina had to provide Switzerland with garanties that this heavy water installation and its technology will not be used for anything but peaceful purposes.

Switzerland is careful in these matters; it is a member of the Club of London (nuclear supplier countries) and it signed the Non-Proliferation Treaty. In this affair, Switzerland's need to respect its international obligations has been subject of an exchange of letters with Argentinan Government. These are guaranties from Argentina that it will correctly fulfill its promises.

In addition, Argentina was invited to sign agreements with IAEA (International Atomic Energy Agency) to insure that its compliance, with the agreed obligations, can be verified at all times.

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October 10, 1980

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